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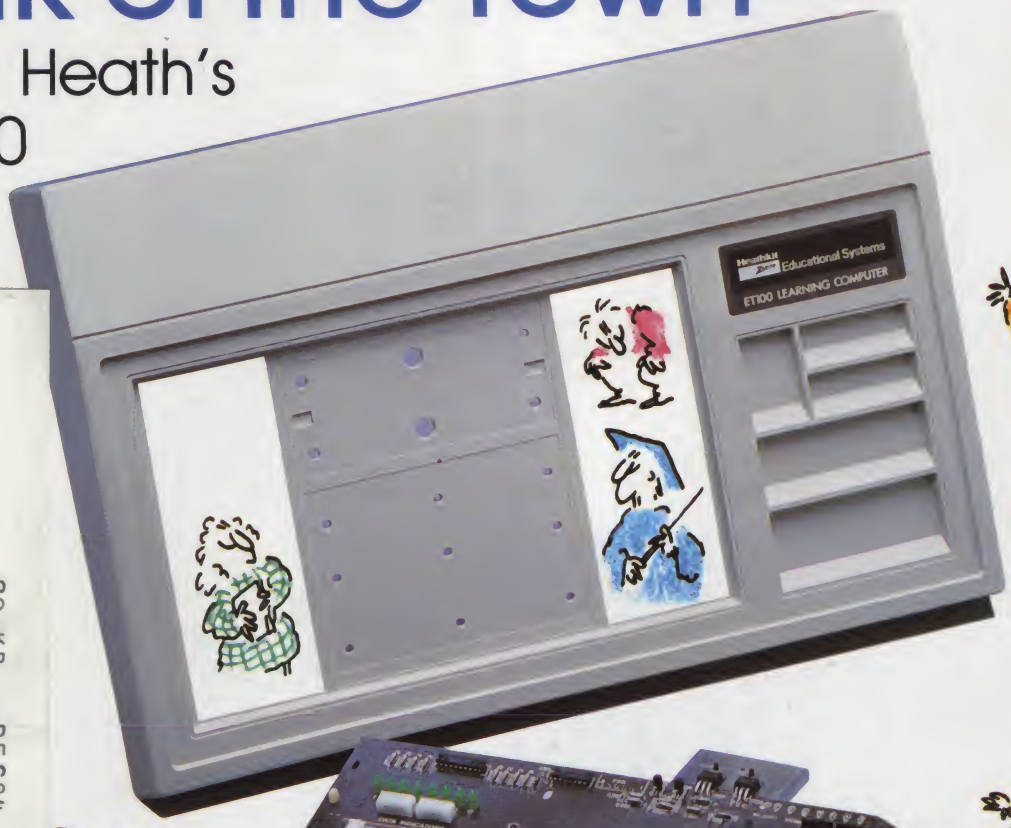

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Contents: September 1983
Volume VII No. 9

MICROCOMPUTING

Heath's ET is endearing too. Page 60

This printer will fit your budget. Page 76

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IBM goes back to basics—pen and paper computing. Page 52

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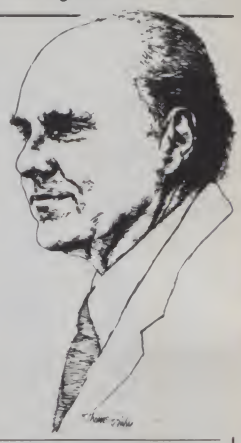
PUBLISHER'S REMARKS By Wayne Green

Give Dealers A Chance



Dealer Frustrations

On the one side we have several hundred manufacturers of desktop computers trying to sell their products. In order to sell these, they need application software to work with them. It's a whole lot easier for a dealer to sell a computer system if he can demonstrate it actually does something of value for the potential buyer.

On the other side we have a growing number of software firms who seem to be trying to make life as difficult as possible for dealers. It's a bear.

At hand is a promotion piece from an outfit selling business programs. They claim to have been in business for over 30 years—which is possible, even if I've never heard of them. But the contract they sent with the promotion really has to be read.

Would you believe a contract that calls for a $50 nonrefundable fee for a demo disk? That binds the dealer to operate out of one and only one location? That binds the manufacturer to no warranties and no responsibility for delays in delivery? That forces the dealer to buy liability and property damage insurance? That gives the manufacturer the right to inspect the dealer's books? That prevents the dealer, if he should cancel the contract, from providing business management counseling, analysis, tax preparation, record-keeping, bookkeeping, accounting, business brokerage, etc., for two years after? That confers no exclusive rights? It is a beaut and should be read by every dealer.

Life is hard enough when you have a good piece of reasonably priced hardware and a good software package. You still have to sell some very reluctant customers, so one of the last things you need is a supplier who wants you to sign a contract relieving him of any responsibility for promoting the product, for making sure the program really works, or even for delivering it when promised.

Would that this contract were unusual. Unfortunately, it is more typical of what is going on than anomalous. It is difficult for me to imagine any dealer signing such a contract, but obviously it has to be happening, or else the firm in question would be out of business.

Hey, Dennis, We'll Miss You

During NCC I stopped by the Eagle Computer reception party to see how the firm was doing. A strange bearded chap came up and said, "Hello Wayne." It turned out to be Dennis Barnhardt, the president, and one of the nicer people in our field.

I'd first met Dennis in 1978 when he was sales manager at Commodore.

Next Dennis turned up in 1979 as the president of MITA, the Microcomputer Industry Trade Association, which lacked enough *raison d'être* to get industry funding and thus survive.

Even with his marketing skills, I was a bit skeptical about his scheme to manufacture the Eagle, about the 350th new microcomputer to hit the market. Despite the odds, he got the show going well enough to take the firm public, coming out of that with a nice $9 million slice of the pie for himself. Not bad for about 18 months' work, eh? No wonder he was so excited about the coming offering at NCC.

The bummer came when I read the *Paris Herald Trib* while in Jordan and noted that Dennis had been killed in a crash of his new Ferrari just a block from the Eagle plant in Los Gatos. We have so few good marketing people in the field that we really can't afford to lose any—and particularly nice guys like Dennis. He will be missed, even by casual friends like me.

The news item conjectured about what might happen to Eagle after this serious loss. I suggest that if the people at Eagle stick to the plans Dennis laid out for marketing, they'll all do OK. Most of the miseries I've seen in desktop computer marketing have come from the basic marketing plans being set up by people without micro marketing experience. And this industry just has no parallel, so without that background there are a lot of horrible errors and lost firms. Indeed, if we lose less than 200 of the desktop manufacturers in the next two years, I'm going to be surprised.□

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WHAT'S NEW, BIG BLUE?

By Thomas V. Bonoma

Drowning in a Sea Of Shortcomings

Where Do Software Buyers Turn for Advice?

Getting Personal

This month marks the first anniversary of this column. It also marks some 100 pages of reviews, commentary, original programs and periodic reviews of major software pieces.

Since anniversaries are a time for reflection, I'll do a little reflecting on software. We'll have our full complement of software reviews, news and views, too. No program this month, though. I'm working on something really special and it's not finished yet.

Read At your Own Risk

The more software I review, the more amazed I am that *anybody*, manager or hobbyist, could wend his way through any large subset of the available market offerings and not wind up thoroughly disgusted. The outstanding packages—1-2-3, WordStar, PowerText and others—stand out like islands in a sea of shortcomings and limited applicability.

It's my belief that people overpay for the code they get, can be considered experts in dead languages if they can work their way through the murky manuals and generally wind up with $299 paperweights to go along with their $6000 paperweight of a computer. As a result, software buyers often feel like five-year-olds at noon on Christmas day . . . surrounded by ribbons and pretty paper, but with a toy that looked better in the ads than it works on the living room rug.

Help!

Well, *caveat emptor* and all that. That's what a free market is for, I guess.

But where do you go for help? Retailers? By and large, they're a joke. I've been told that IBM PCs and NEC printers are incompatible, that The MBA was written to run under DOS and that The Last One is a useful program generator. I'm sure you have your own stories; retail sales people are the best advertisements for mail-order houses there could be, because they just don't know much about the applications they'd like to sell.

So how about the magazines? Not much better, I'm afraid. The PC-targeted ones, with one exception (it begins with S . . .) are locked in mortal combat to outweigh each other, and they often neglect either good reviews or solid tutorials between their heavier and heavier covers. The others seem locked into outweighing and outjargoning each other, all at once. And, for us poor users, or worse, managers who'd like to be users, there's very little indeed.

It is characteristic of high-growth markets to support more activity than real innovation; they wind themselves up in their own ideas of what's right. But producers and others in the industry can be taught. Vote with your dollars, of course, but vote with your word processors, too. Write to the vendors, and write especially to the magazines *about* the vendors, the retailers, the mail-order guys and the magazines, too, so that things will change. Things *can* change.

Words, Pictures and Numbers

Words

This column comes to you courtesy of The Final Word, an outstanding word processing system that operates in two modes. For short and simple documents, just type on the screen the way you might with WordStar, Volkswriter or any other first-rate processor. If the documents get complicated or if you get fancy, FW has a variety of special formatting and other functions you build into your text with English-like commands.

All commands use the @ character as a signal to FW that what follows is a directive, or an "environment." More than 100 such directives are available to the user, making FW absolutely formidable at text processing. The directives vary from simple commands to the bolding of text, and underline it with complicated ways of assigning long names to shorter variables so you don't have to keep on typing them over and over.

The environments are even more flexible. There are four levels of FW-tracked, numbered and formatted heading commands, such as Chapter, Section, Subsection and Paragraph. Use of these commands causes FW to automatically number the various sections without your interference, and to construct (again, automatically) a table of contents with everything listed in the right place.

A similar set of commands exists for people (like me) who don't number paragraphs and sections, but need automatically formatted headings, subheadings and the like. In fact, Heading and Subheading are FW commands; note the English-language flexibility here.

FW also handles footnoting, superscripting and subscripting automatically. It even semi-automatically constructs indexes to books. The really fun stuff, though, involves the text format commands, which include at least four ways to construct lists (see example), and an "@ verse" command, which prints poetry for those inclined to iambic pentameter.

More Final Word Features

Here are more features of FW:

- Style—FW is easy to configure for double-spaced manuscripts vs single-spaced letters on letterhead. This parameter informs the program how you want your text to appear. Input is allowable as lines, characters, picas, points, inches or even centimeters for most of the Style directives.
- Headers/Footers—Headers and footers can be multiline, can include page and chapter title references automatically and are most flexible.

Address correspondence to Thomas V. Bonoma, 45 Drum Hill Road, Concord, MA 01742.

- Printers—FW supports a full complement of quality printers (such as Epson, IDS, Spinwriter and Diablo) and has translation tables to produce fully proportional print on those printers that can do it.
- State Save—Because FW constantly saves your work automatically, a power outage loses no work. Even "lunching" the buffer files doesn't hurt anything.
- Multiple Windows—FW allows you to have two documents on the screen at one time and up to 12 in its many text-editing buffers. It's similar to Edix in this regard.
- Menu-driven—It's driven through a series of menus, has on-line help and is moderately friendly to users.
- PC Keys—FW has been integrated with the PC function keys for ease of use.

Final's Flaws

Final Word is a super word processing system, but it does have flaws—and they're due mostly to the program's high aspirations. Although a basic installation can be done with ease by the user for his system, this is one program I'd want customized by my dealer when I bought it. That's because some printers and other peripherals need to be set up with certain ports on the IBM and certain specialized tables for text translation (all this is included in FW). And although the advanced installation program is simple and friendly, the choices available to the user get mind-boggling quickly. If you're not a techie, buy this one retail and get some help.

Also, I find the array of commands available to me confusing in their multiplicity. I've integrated FW with Prokey to simplify the array of keystrokes, choices and formats available to me. It's likely that the average user will not need to access many of FW's advanced features frequently, though, and it's important to note that you can type away on the system all day, meeting normal requirements (such as underscores), and never need these features.

Although FW is excellent, it rivals WordStar in complexity. Fortunately, FW comes with some disk- and book-based tutorials, and it has an excellent manual.

A recent survey in *The New York Times* suggests that most PCs are used for word processing. If yours is, you can make your machine do everything but bark with FW.

Volkswriter's International Edition

In a different way, Volkswriter's International Edition also is a masterpiece. Essentially, VWIE is VW version 1.2 with the very important addition of keyboard and printer character-translation tables.

That means that if you're French, you can reprogram your keyboard for the PC's French character driver sold with your machine in Quebec. More useful for us English-speaking folk, perhaps, is the

print-table capability. This allows characters on the screen to be translated to characters on the printer, giving VWI text graphics capabilities you can get with no other word processor. Example 1 shows what I mean.

Pictures

Graphwriter is a presentation graphics package (programmed in Pascal) that supports the IBM PC, the HP7470A and two other plotters. Its makers claim it rivals the kinds of presentation output available from $40,000 mainframe systems like Teligraph, and as a veteran of both those and Graphwriter, I would endorse that claim.

In addition to the standard pie, bar and line charts, GW allows you to select from text/word charts, overlays to put on other charts (as with transparencies), and, with an optional set of formats, Gantt charts, bubble charts, organization charts and the like.

The program is exceptionally friendly, and it's capable of making decisions for the user (such as when to turn titles sideways or when to reduce the size of a graph). It accepts VisiCalc files, has input forms for users who are not operators and can automatically move titles, legends and commands, alter character fonts, sizes and colors, and relocate graphs almost anywhere on a page.

GW is menu-driven, well-integrated with the PC function keys and well-documented (it includes two pocket reference guides). It needs two 320K drives, 128K of memory, a color monitor/color board and an HP plotter to work.

Graphwriter is exceptionally friendly, and it's capable of making decisions for the user . . .

The only thing wrong with GW in its current incarnation is that it makes The MBA look fast. That's no exaggeration; when you punch up a menu selection, a message comes on the screen that says, "Wait about two minutes." This snail's pace is due to the immense amount of code (four disks worth) needed to run GW.

The GW people say they are working on speed-ups, which are sorely needed. But until (and unless) they can make this program somewhere in the area of five or ten times as fast, many users will be thrilled with the quality of the output and ease of use but angry with the time it takes to get there.

Also no winner in the speed category is Graph'n'Calc. GC, which requires only one disk and a 64K machine with a color adapter, is a limited (10 × 100) spreadsheet, graphics and, most importantly, forecasting program, which is well-packaged and well-thought-through.

GC permits relatively sophisticated mathematical forecasting (single, double and triple exponential smoothing) over data that would be interesting to a manager. It works smoothly (if not quickly) and it has first-rate graphics capability, which automatically uses the color screen while the data remains on the monochrome (if you have both).

Optional upgrades include a compiled version of the program that isn't much quicker, because most of GC's delays are to go out to disk for another program module (the compiled version requires 128K) and HP7470A plotter support.

I really like GC's features: it computes seasonality of sales figures, automatically generates comparative statistics on two sets of data, does exponential smoothing, automatically "grows" values by a percentage or an amount, handles correlation analysis, logs and works as a desk calculator.

Sure, these features are nothing you can't do with VisiCalc or 1-2-3, but it's all there for you, it's businesslike and it works flawlessly, from calc'ing to graphing to printing and plotting. GC even comes with a forecasting book and a highlighter so you'll read it. But the slowness is a problem, even with a hard disk, and the timing of GC couldn't have been poorer considering 1-2-3's recent success.

In a different picture's vein is The Draftsman, which I looked at before (but didn't review). This version is from Star-Ware, a new company with some good products.

The Draftsman has a relatively complete on-line tutorial; it's so complete that the manual is just a skeleton for the on-disk "book." Essentially, The Draftsman is a graphing package that produces pie, line or bar charts from a spreadsheet-like data entry screen to your specifications.

The Draftsman is flexible, too. For example, pies can be exploded, titled and footnoted, and colors can be changed at will. The Draftsman works in medium- and high-resolution graphics, and it allows you to adjust the size of your plot (within screen limits). It supports an Epson/Graftrax or an HP plotter for hardcopy.

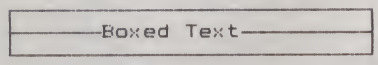
The fun starts after you're done graphing, however. The Draftsman's flexible

Volkswriter™ International Edition is different from Version 1.2 of Volkswriter™ in that it adds two exceptionally functional "table files" to VW's repetoire of abilities. One, a Keyboard file, essentially allows you to redefine any normal or speical (e.g., alternate) keys with the special characters the IBM is capable of displaying. Here are some samples:

Formulae: α + 2*β ≤ ΣΘ" ≈ τ

Fractions: 16½ and 19¼

Line Graphics:



The nice part about all of this, as you can see, is that you can use underlining, bolding and all the other VW special effects and get all these characters without worrying about a thing.

VW works with about 15 popular printers. As long as you have a supported printer, you can create a printer table to take advantage of its special features. It doesn't do much good to display special characters if you can't print them, and that's where the PRINT tables come in. What you are looking at was generated on a "bootleg" IBM Graphics Printer (i.e., an Epson MX-80 F/T with IBM Graphics Printer ROMS stuffed in it). Other printers supported with special conversion tables by VW include NEC Spinwriters, Okidata Microline 84, Epsons (both MX-80 and MX-80 III with Graftrax Plus) and a numberof others. The release diskette, though, has quite a few more printer tables than are listed in the appendix, so be sure to check there for the most current support provided.

Example 1. Sample of Volkswriter International Edition's capabilities.

on-screen editor allows you to paint and to add lines, boxes, text, arrows and circles to your graphics. And creating an organization chart or writing your name on a graph in script can be done.

I have mixed feelings about this program. It impresses me more as a hobbyist's toy than as a working program, for several reasons.

First, it has a lot of options, such as chart sizing, that have to be input in screen points or other obtuse units. Next, it seems to impose undocumented restrictions on the user. For instance, anything longer that a three-letter abbreviation won't fit on the X-axis for bar charting. Similarly, the program seems to provide smaller screen plots than are either necessary or useful, averaging something like a 5 × 7 display area.

When I evaluated the Plantronics version of this software, I didn't review it because I couldn't get it to operate with a print spooler, the Apparat Spool/64. Apparently, some of the print codes output with The Draftsman interact negatively with the spooler's own processor to cause faulty output (this can happen with Lotus' 1-2-3 as well). That's no fault of The Draftsman, but at first I wasn't sure if it was the program or the spooler.

Before Lotus' graphics package (and, in a way, GC's), I think I would have been more impressed with The Draftsman. It's a competent package, to be sure. But things are heating up out there!

Numbers

I'm sure you've read reviews of TK! Solver elsewhere, so I'm not going to spend a lot of time on it. As you know, it's an impressive scientific/technical model-solver with some fancy features, including rudimentary graphics.

The interesting thing, in my several-hour sojourn with the package, though, is not that it's so well-done, but that it's clearly a solution in search of a problem. It's a darned complicated program that requires that the operator bring to it the sophistication of understanding in a conceptual/modeling sense that would allow him to take advantage of its benefits. For the average manager or hobbyist, I suspect, TK's capacities far outstrip most problems he'll ask it to solve.

If I'm right, what may still save this introduction are the TK! Solver Application Paks (Financial Management and an engineering one have been released to date), and the TK! SATN Newsletter. The first two are well-done and reasonably priced packages where common problems (analyzing a corporation's financials, for instance) have been worked out on TK, and all the user has to do is "fill in the blanks."

The latter is a nice newsletter (not free, unfortunately) put out by Software Arts. It explains new uses for TK to users. We'll see. If I were a betting man, though, I'd predict that not as many packages will be

sold as predicted by the prophets, and that many sold won't be used.

InSoft has introduced and is promoting heavily The Accountant, its general ledger system. The documentation is well-done, the system is provided on 12 disks (three each for A/R, A/P, Payroll and G/L), and it appears to be well-integrated. In addition, it significantly underprices Peachtree Software's programs. If there's an accountant out there—or better yet, a bookkeeper with a PC—let me know and you can review The Accountant for us.

Number Cruncher and Viz-a-Con

Number Cruncher was promoted as "1-2-3 with full text processing abilities." Well, 1-2-3 it isn't, but it is a financial modeling system that apparently can do its magic within letters or other text. I say "apparently" because (1) the on-line NC demo wouldn't run; (2) there is little to nothing in the manual about text editing or text manipulating commands (but plenty about financial model creating); and (3) I gave up in frustration on the program.

I may have an early version, but I can't believe someone would let software go out the door that way.

Finally, there is Viz-a-Con, a sheet consolidator for VisiCalc. Consolidation means adding a third dimension, multiple "pages," to your spreadsheet. This is the same capability that adding subsidiary sheets gives you (1-2-3 has partial capability here, MultiPlan has moderate capability and EasyCalc and PerfectCalc have broad capability).

Viz-a-Con automatically combines stored data files from your VisiCalc model in the order you specify, prints multiple copies of reports and saves results and reports for future use or for word processor incorporation. Because Viz-a-Con and VisiCalc run separately, you can save your VisiCalc files in DIF format for use with Viz-a-Con.

At first glance, one wonders why anyone would pay $140 for Viz-a-Con when a true subsidiary spreadsheet is $99 or so. But, if you know Viz-a-Con and have a lot of stuff developed using it, it can make sense for you.

The "Big Blue" Black Book

Prices, Addresses of This Month's Featured Products, Companies

The Accountant ($365)
InSoft
10175 S.W. Barbur Blvd.
Portland, OR 97219

CP + ($200)
Taurus Software
3685 Mt. Diablo Blvd.
Lafayette, CA 94549

Curse of Ra ($19.95)
Jabbertalky ($29.95)
Star Warrior ($39.95)
Upper Reaches of Asphai ($19.95)
Epyx/Automated Simulations
1043 Kiel Court
Sunnyvale, CA 94086

The Draftsman ($200)
The Installer ($39)
Mail Manager ($39)
Money Matters ($99)
MultiJob ($159)
StarWare
2000 K St. N.W.
Suite 504
Washington, DC 20006

The Final Word ($300)
Mark of the Unicorn
PO Box 423
Arlington, MA 02174

FriendlyWare PC Arcade ($49.95)
FriendlySoft
3609 Smith-Barry Road
Arlington, TX 76013

Golf Challenge ($24.95)
Mouskattack ($34.95)
Sierra On-Line, Inc.
Sierra On-Line Building
Coarsegold, CA 93614

Graph'n'Calc ($199)
(Plotter support—additional $50)
Desk Top Computer Software
Suite 29-303
303 Portrero St.
Santa Cruz, CA 95060

Graphwriter ($495)
Graphic Communications, Inc.
200 Fifth Ave.
Waltham, MA 02254

Keynote ($99)
Advanced Software Interface
2655 Campus Drive
Suite 260
San Mateo, CA 94403

Network Consulting p-system ($845)
Network Consulting, Inc.
3700 Gilmore Way
Burnaby, B.C. V5G 4M1
Canada

Number Cruncher ($395)
Pyramid Data, Ltd.
PO Box 10116
Orange, CA 92711

Prokey ($75)
ProSoftware
4710 University Way N.E.
Suite 601
Seattle, WA 98105

TK! Solver ($295) and
Financial Management
TK! Solver Pak ($100)
Software Arts, Inc.
27 Mica Lane
Wellesley, MA 02181

Viz-a-Con ($139.95)
Abacus Associates
6565 W. Loop South
Bellaire, TX 77401

Network's Pascal, CP+, Multi-Job and Other Stuff

I've spent almost two months reading though the six-inch stack of documentation that comes with Network Consulting's p-system implementation, and it's obvious to me why the best non-DOS software manufacturers use it over either of IBM's Pascals. DataFax, PowerText, The MBA, VersaForm . . . you name it and it uses Network's implementation of Pascal. Supplied on seven disks—a copy of *The UCSD Pascal Handbook* is even thrown in with the documentation—NCI's package is the best around. It offers hard disk support, RAMdisk support, 8087 numerical coprocessor support, serial communications support, double-side/double-track floppy disk support, ten-sector disks (25 per cent more space), faster disk reads and programmable function keys. And that's not even counting any of NCI's applications, like the awesome ASE editor, which you can see in use on PowerText.

Simpler Than Basic, But . . .

The interesting thing about Pascal as a programming language is that in many ways it's simpler than working in Basic. Unfortunately, IBM's releases have been buggy (this includes Fortran, too), incomplete and pretty hard to work with (although UCSD Pascal has just been cleaned up). NCI's Pascal takes away much of the difficulty of managing lower-level tasks, such as peripheral interfacing, and lets you concentrate on your work. You won't buy NCI's system cheap, but you won't be sorry if you look to it when you learn Pascal.

CP + is a simplified way of interacting with your CP/M-86 (not DOS). You select a program instead of worrying about system-level run commands, you manage listings either forward or backward at will, and you queue the printer with up to ten files for automatic printing. Similar

ease-of-use overlays exist for looking at a file or directories or for file copying, erasing or renaming.

Those of us with 1-2-3 have gotten fat and lazy by virtue of Lotus' Access System, which does many of these things for us. Those of us who work with CP/M, though, now have a way to simplify operations.

Multitasking Package from StarWare

MultiJob from StarWare is the first of the multitasking packages to hit the market. Though it works with a 64K machine, the more memory you have, the better.

What does it do? Well, you run MultiJob after boot and "assign" blocks of memory to Alt key combinations (Alt-1, Alt-2, etc.). Then, to switch between them, just hit that number.

Consequently, you can have Final Word running in one 96K area of memory, and Multiplan in another. To switch back and forth is no problem, and for all intents and purposes, you are running both programs at once. Of course, there's no way to use MultiJob with copy-protected, self-booting software or with non-DOS programs, like The MBA. (I couldn't get it to work with 1-2-3, either.) Nonetheless, if you'd like WordStar and SuperCalc running at the same time with dBase, and you have enough memory, MultiJob will do it for you.

StarWare's program greatly outstrips its documentation, a seeming characteristic of the company, so don't expect too much help from the manual. The program, however, is so simple to use (it's copy-protected, by the way), that you'll have no trouble.

Prokey has been reviewed here before, and now comes Keynote. Both are "macro" generators; that is, they assign any string you choose to two-key combinations (usually, with Alt), so that Alt-E can become "The Charlie Conoway Corp., Ltd." in all your letters, if you choose.

Prokey does more than Keynote and it costs less, so we have the rarity of a clear choice, right? Well, almost. Prokey's variable macros allow the user to fill in whatever he chooses at the time the macro is invoked—a major advantage. Keynote, however, is somewhat easier to use than Prokey, a consideration as well. Also, both Keynote and Prokey work with the Compaq portable computer, a possible consideration. And I've found some problems getting Prokey to work reliably with Mailmerge, although this has been fixed in versions 2.12 and later. Therefore, what you need should determine what you buy. Keynote is less fancy, but easier to learn. Prokey is more complete.

Relaxing: *Briefly Noted*

The major news on the games front is Friendlyware's PC Arcade, which shows you how far text graphics can go on the

one hand, and how to give real value for the money on the other. It has on-line help, instructions and 9½ games (the tenth isn't really a game, but a display), several of which are sure to please. This is another winner from the folks who did such a good job with their Introductory Set.

From Sierra On-Line, makers of high-quality games for the PC, comes Golf Challenge and Mouskattack.

In Golf Challenge, you play a medium-resolution game of golf on a tough course. Mouskattack can be described as Pac-Man with rats trying to eat a plumber (you), protected by only two cats. You're accompanied by some great music.

From Epyx/Automated Simulations come two new expansion modules for its Temple of Apshai game. In Curse of Ra and Upper Reaches of Apshai, you meet with new treasures—and increasingly interesting ways to die. You'll need the Temple of Apshai game to use these modules.

Epyx/Automated also has released two new games. In Jabbertalky, you play a set of programmable word games. Star Warrior pits you as a sole fighter against entire armies, nuclear installations, and the like. The graphics are superb on this game, the action is faster than Apshai and the playability seems excellent. It's definitely a game to look at—it's going to be another classic.

Money Matters, The Installer and Mail Manager—all from Starware—are three programs whose operation outruns their documentation, with the possible exception of Money Matters. This program, a home accounting package with checkbook manager, graphics and tax and budget categories, supports cash flow analyses and budget scenarios, and has reporting capabilities. It requires 96K, and it's a solid alternative to other packages on the market because of its completeness and full on-line help facilities.

The Mail Manager doesn't really manage mail at all; rather, it stores and prints mailing labels, and does so competently.

The Installer enhances WordStar by configuring it to support the special capabilities on any one of ten popular printers, including the Epson, IDS and NEC printers.

Enhancing WordStar for your printer is not particularly tough without the Installer, if you're familiar with Debug and your printer manual. But, if you don't like mucking in machine files, or if you don't have the time, the Installer is a quick alternative to let you use the full capabilities of your printer with WordStar's special control codes.

The Mail Manager doesn't really manage mail at all; rather, it stores and prints mailing labels, and does so competently. It supports selective search, and it's quite flexible about the labels it will print. You could, for instance, use it quite satisfactorily for disk labelling.

The Mail Manager's documentation is thorough—though unprofessionally produced—and suitable for beginners.

What's wrong with it is that it doesn't have instructions or support to import files from other database managers (dBase, Data Design, 1-2-3) that operate under DOS. Thus, Mail Manager blithely assumes that you don't have an existing name-address file and you want to make only mailing labels. If that's your only application, fine, but I expect a label-maker to interact with my other software.□

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By Frank J. Derfler, Jr.

Mountain Highs And Knee-tops

Word Processing In the Rockies With Tandy, Epson

On the same day that the President proclaimed National Physical Fitness month, the air in Washington turned so foul that you could scarcely see the Washington Monument from across the Potomac. I decided to stay physically fit by leaving the city.

This article is being written at altitudes ranging from 37,000 feet (Boeing 747) to 4000 feet (Montana Rockies). I'm doing my word processing far from any commercial power plants, pollution or foul air.

This month, I'm going to use my Rocky Mountain vacation to compare the word processing powers of the two "knee-top" computers I have with me: the Epson HX-20 and the Tandy 100. They have very different features, so comparing them makes a good study on what a truly portable word processor should do.

Address correspondence to Frank J. Derfler, Jr., PO Box 691, Herndon, VA 22070.

Epson HX-20

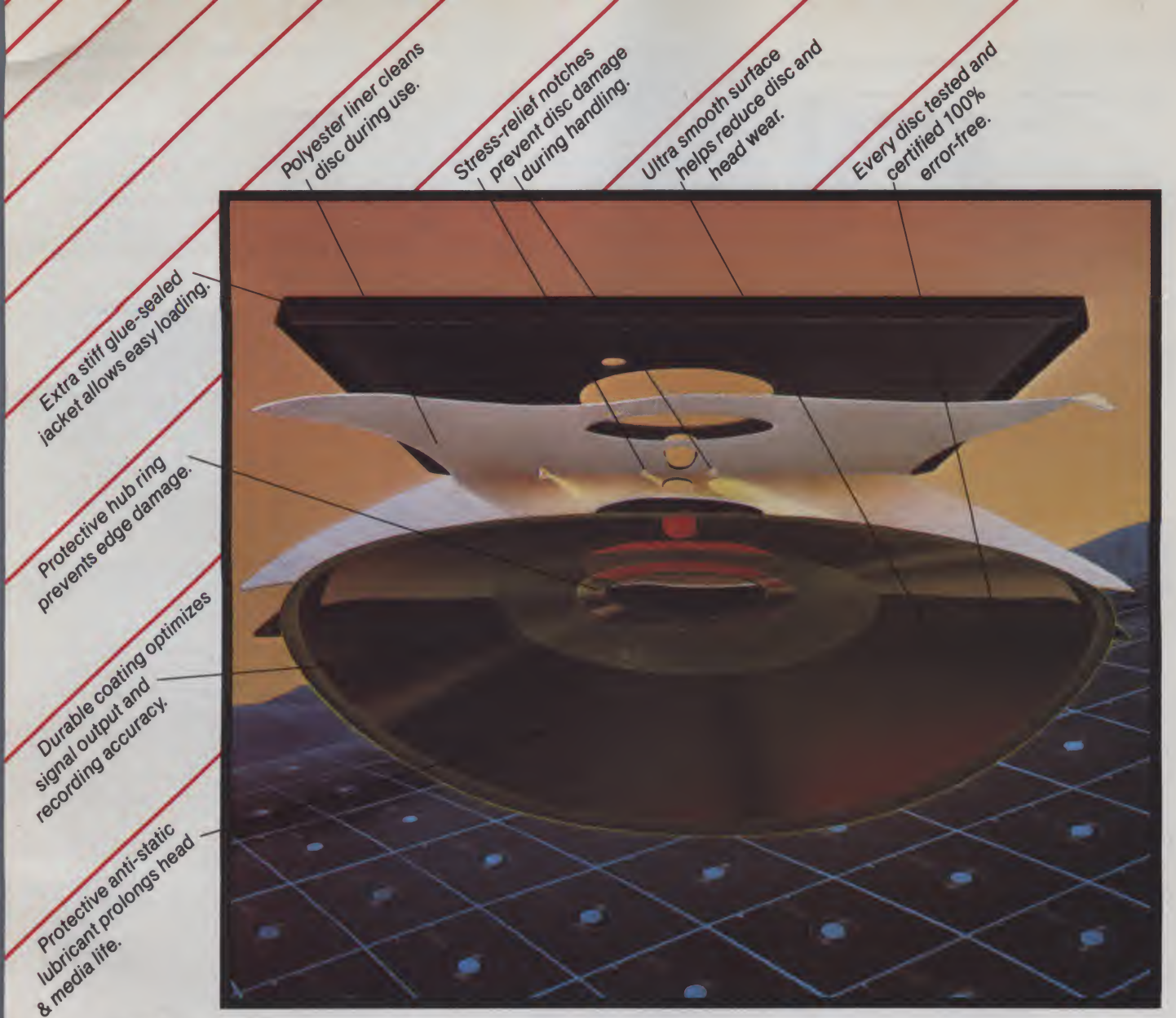
Microcomputing published a thorough review of the Epson HX-20 in the April 1983 issue. Until June of this year, HX-20 users were frustrated by the inability to actually "do" anything with their machines (aside from programming in Basic). In June, Epson released its long-promised word processor for the HX-20: SkiWriter.

SkiWriter ROM

SkiWriter comes as an 8K ROM that is installed inside the HX-20 by an Epson dealer. The installation takes only a few seconds. The SkiWriter program then appears as a selection on the HX-20 sign-on menu.

The SkiWriter package isn't as powerful as a 50K disk-based program, but it provides all of the practical features you would expect in a word processor. You can enter text in either an overstrike or an insertion mode. You can delete characters or blocks and move blocks of characters. When you're done editing, you can print the text with the line width and margins you specify.

These functions are selected by the use of



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specially designated and clearly marked keys. There are no control codes to remember or menus to work through.

Display

The HX-20's greatest limitation is the size of its screen. It displays only four lines with 20 characters on each line.

Epson gave the HX-20 the ability to move its screen over a larger page of text contained in memory, but SkiWriter doesn't use this "windowing" capability. The author of SkiWriter chose instead to display the text in column form. The program wraps complete words down to the next line when the 20-character limit is exceeded.

I did not find this limited display width to be a significant problem, just as you don't find the words arranged in columns in newspapers and magazines hard to read. Although it's difficult to judge the length of your entire work (there are no line numbers or cursor coordinate displays), the screen size did not limit my continuity of thought.

Printing and Saving

The Epson has two big strengths. Built into the system are a microcassette recorder and a small dot matrix printer. These two devices are integrated into the word processing system and operate smoothly without the need to fumble with any external controls or cables.

The recorder can save and search for text files using file numbers you assign. The rewind and search features are all built into the program and operate without direct commands from the keyboard. If you tell the HX-20 to find a file, it automatically rewinds the tape and searches for the file you want.

The printer uses adding machine tape and gives high-quality print in a small space. It would be noisy to use in a public library, but on the coach class of a 747 in flight, it didn't disturb the people in the seats in front of me.

I have an easier time editing and proofreading text when it's in printed form than when it's displayed on a screen. This little printer allows me to pull off a quick copy of the text for editing. I usually make at least two printed drafts for editing before I send the output to a full-size printer.

The Epson HX-20 has an RS-232C port for connection to a modem or to another computer. It has a separate 4800-baud serial port for use with Epson serial printers.

I don't understand why Epson doesn't provide the commonly used parallel printer connection, but if you want a full-size printout, the HX-20 can supply it through a serial printer. The manual contains listings of short Basic programs that can vary the baud rate and word length of the serial ports.

As a bottom line, the HX-20 suits my knee-top word processing needs perfectly. The ability to easily save text and to print it in draft is important to my document production process.

The Epson, though, doesn't have everything. If you're more interested in communicating your text over telephone lines than you are in printed drafts, or if you want a bigger display, the new Tandy 100 will attract your attention.

Tandy 100

The Tandy 100 attracts attention wherever it goes. As a general-purpose computer, it has a wide range of capabilities.

The Model 100's built-in modem and dialer make it a useful portable terminal for data communications. The scheduler and address organizer give the system interesting executive support capabilities. The word processing power of the system is, however, probably its most widely desired portable tool.

Word Processing

The Model 100's word processor always operates in the insertion mode. You cannot simply strike over a character or word to be replaced. You must insert the correct text and then delete the undesired material. This means that correcting text is always a two-step process.

I had a little trouble learning to use the delete/backspace key. In its unshifted mode, it deletes the character to the left of the cursor. You have to use the shifted position of this key to get it to remove the character the cursor is on.

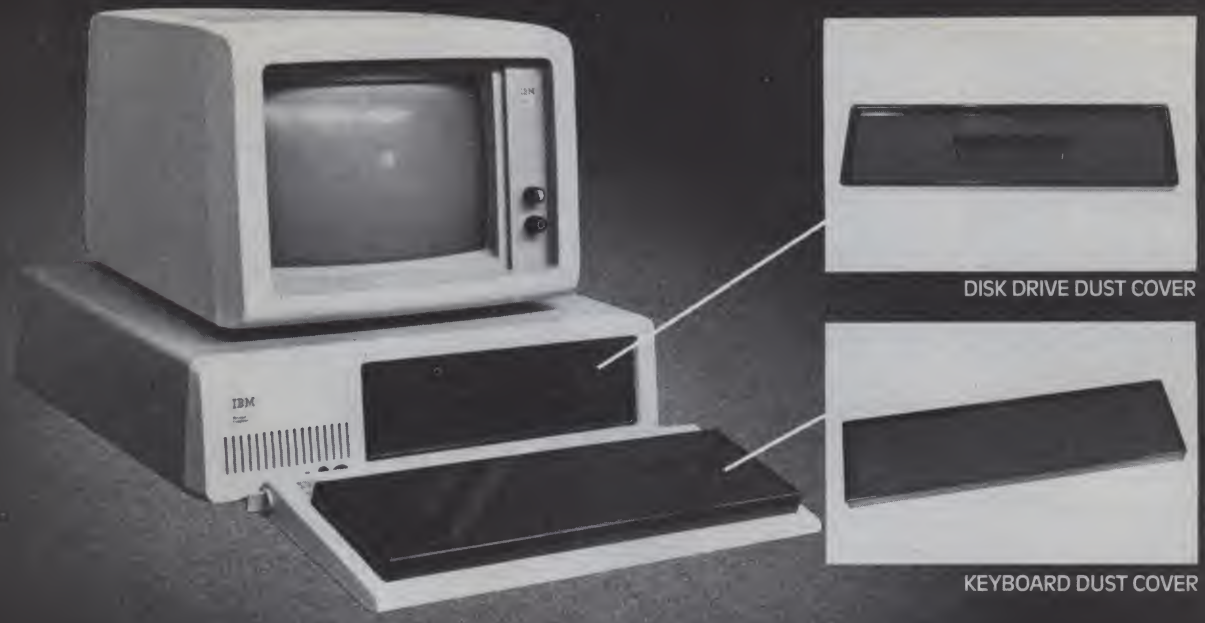
The cursor control keys on the Model 100 are easy to use. The sequence of controls required to mark and move a block of text can be learned with only a few moments of practice, but they aren't as intuitive as those on the Epson. The Model 100 displays a designated block of text with reverse video.

Display

The screen on the Model 100 displays eight lines of text with 40 characters on a line. This larger display improves your ability to check text for continuity and to carry through with ideas, but it still doesn't give you a full letter-width display or show you exactly what your finished work will look like.

One of the visitors to our Montana Mountain Lodge was a reading teacher in elementary school. She pointed out that the 7¾-inch-wide screen on the Model 100 forces you to move your eyes across a wide area to read a relatively small amount of text. According to some reading theories, this eye movement reduces reading speed and comprehension. You can choose your reading theories and, accordingly, your screen to meet your own needs.

The Model 100 will give you a wide display of 320 characters. The Epson HX-20 will give you a narrow display of 80 char-



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acters that can be quickly scanned. The dot matrix character display on the Model 100 is less dense than the one used on the Epson HX-20, so the characters are less than fully formed. The dots are particularly visible on the curved characters, such as the C and D.

When you're done creating a document on the Model 100, you can leave it in RAM memory and create a new text file for your next document. The old file will remain ready in RAM until it is killed or until the special memory-keeping nicad battery goes flat. This is less sure than off-loading the file to a tape, so you have to decide what level of reliability and portable convenience you need.

The Tandy Model 100 can interface with an external tape recorder. You can use an external tape machine to save your text files, but this certainly isn't as convenient as having an internal tape capability.

If you rely only on RAM storage, you may be limited in the amount of text you can save. If you have several data files saved for the address and other applications programs, you won't have much room for text.

A 16K Model 100 signs on with 13,254 bytes free. This space is used for all address, schedule, Basic and text files. Obviously, it will fill up fast. You'll have to make some memory allocation decisions to adjust your ability to either create a lot of text or to use the other capabilities of the Tandy 100.

If you want to use all of the features of the 100, you will have to equip yourself with an external tape recorder to save and load data files. The external recorder, its cables and the manipulations required to use it, however, detract from the portability of the Tandy machine.

Head to Head

After spending several weeks using both of these machines as word processors, I think the Epson gets the nod over the Tandy for features and usefulness. It is not as good a general-purpose machine because it doesn't have as wide a variety of applications programs available in ROM, but it has word processing features that provide excellent flexibility and operating convenience.

The two systems fall into the same price range. An 8K Tandy 100 lists for $799 and an 8K RAM expansion costs $119.95. The 16K Epson HX-20 lists for $795. The microcassette recorder is $139.95 and the SkiWriter word processing software lists for $129, but they are often deeply discounted (sometimes free) if purchased with the HX-20.

The Future

I'm really impressed with the usefulness of knee-top micros. I know I get more return on investment from my knee-top systems than from any other microcomputers I own. It's easy to predict that in 1984, when the 256K RAM chips become plentiful, knee-top machines certainly will lead the desktop computers in unit sales.

The knee-toppers won't get much smaller than the 11½×8½ inches the Epson and Tandy machines occupy. There are human limits on the minimum size of display screens and keyboards, but the availability of larger blocks of memory in small low-power packages will multiply the power and usefulness of these machines many times.

If you travel—or even commute to work—you probably have some knee-top power in your future.□

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3

By Robert W. Baker

Accessing CBM Disk Drives

The Secrets Of 8050/8250 Compatibility

8050/8250 Compatibility

From Mike Todd's column in the May 1983 issue of the ICPUG newsletter comes information on compatibility between Commodore's 8050 and 8250 disk drives.

The 8050 is a single-sided system, while the 8250 is a double-sided disk. The relative file structure on the 8050 is limited to 182K, while the 8250 can, in theory, use the entire disk to store relative files. With the 8250, it's possible to use disks that originally were written on an 8050, but you should take several precautions.

The first attempt to access an 8050 disk on an 8250 drive will result in a disk error, but future accesses will work correctly. To use relative files on the 8250 drive with an 8050 disk, the 8250 must be set up to handle unexpanded relative files by issuing the following command sequence:

```
OPEN 15,8,15
PRINT#15, "M-W";CHR$(164);
  CHR$(67);CHR$(1);CHR$(255)
CLOSE 15
```

Copying relative files from an 8050 disk to an 8250 disk is simple. Enter and run the above code to disable expanded relative files. Then, with the 8050 disk in drive 0 and a formatted 8250 disk in drive 1, copy the relative file in the normal way, using:

```
COPY D0,"source-file" TO D1,
  "destination-file"
```

If you get a disk error on the first attempt, repeat the command. If you did not access the disk in drive 0 as yet, the error is expected.

Once the copy is complete, you'll need to reset the 8250 drive by switching the unit off and on again. Please don't forget normal disk safety rules: remove the disks from the drives *before* switching power on or off! After the drives are reset, put the Demo Disk supplied with the 8250 into drive 0 and the 8250 disk just used back in drive 1. Then load and run the program Expand Relative to complete the conversion.

Copying ordinary files from an 8050 disk to an 8250 disk is also straightforward, as long as you remember to access the 8050 disk first to avoid disk errors. With the original 8050 disk in drive 0 and an 8250 disk in drive 1, format the 8250 disk in the usual way, using the header command. Then perform a Catalog D0 and simply copy the entire disk using the Copy D0 To D1.

Commodore recommends that any software existing on 8050 disks should be copied to 8250 format. This works fine with VisiCalc and WordCraft, but Silicon Office and SuperScript are copy-protected. You'll have to see your local dealer or the program's authors for help on these and other copy-protected products.

One final difference between the two disk systems is the error code returned in DS$ or through the error channel. On the 8250, the error code consists of five items instead of the usual four found on the 8050. The format is now:

```
Error#, message-text, track#, sector#,
  drive#
```

Of course, don't forget that not all disks suitable for use on the 8050 can be used on the 8250 drives. Only *double-sided*, double-density disks should be used in the 8250 drives. Since the 8250 records 77 tracks of information, you might want to use the higher-density, certified disks, but the normal double-density disks generally work.

While on the subject, the 4040 family of Commodore drives work quite well with normal single-sided, single-density disks. This includes the 2040, 3040, 4040, 2031, VIC-1540 and VIC-1541 drives. The normal industry-standard, single-density 5¼-inch disk stores only about 80K of data.

Commodore's special recording techniques put a varying number of blocks on each track of the disk to record about 180K of data on the same disk. Some dealers think that you need double-density disks when they see higher disk capacities on Commodore drives.

PET Emulator

The PET Emulator software package for the Commodore-64 allows you to execute programs designed for the PET. The assembly language program modifies the C-64 so that it operates like the 2.0 Basic PET 2001 in most respects.

The modification consists of two parts: memory reconfiguration and system interaction interpretation. As an added bonus, you get a copy of the DOS Wedge included within the Emulator program.

In normal operation, the C-64 stores Basic programs in the $0800–$9FFF memory range, and the screen occupies locations $0400–$0800. The PET stores Basic programs from $0400–$7FFF, with the screen occupying locations $0800–$8FFF. The Emulator reconfigures the C-64 memory so that it duplicates the PET internally. Thus, pokes to the screen and the program, and other such direct access operations, work properly.

Many PET programs access the system directly with peeks, pokes and waits. Most of the common locations are interpreted by the Emulator and should operate exactly as they would on the PET. Any peek at location 50003 to check the Basic version type is supported, along with peeks and pokes at location 59468 to set upper/lowercase.

All pokes and peeks between $0000 and $03FF are translated by the Emulator when possible. Any pokes that cannot be interpreted return an Illegal Quantity

Address correspondence to Robert W. Baker, 15 Windsor Drive, Atco, NJ 08004.

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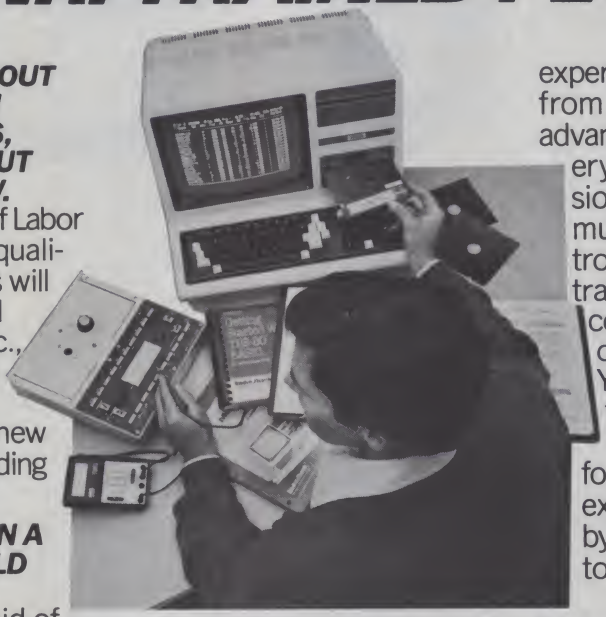

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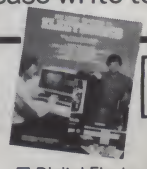

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Error along with the line number where the error occurred.

Cassette buffer #2 is also available for machine code programs, the same as on the PET. Machine language programs that do not call system routines in the ROMs will work with no modifications if they reside in this cassette buffer.

The CB2 sound is emulated as closely as possible. Certain high tones available on the PET cannot be obtained on the C-64, and the pitch of the tones varies across the scale. Musical tunes may not be emulated correctly, but other sound effects usually sound better under the emulator than they may have on the PET.

In High Memory

The Emulator loads into the free RAM area in high memory, starting at $C000. The code actually starts around location $C184 and continues up to about $C6AE. The area between $C000 and $C184 is used for working storage and message text.

During initialization, the program changes the NMI interrupt vector and the pointers for the start of Basic text, for the highest address used by Basic, for the start of screen memory and for the top of screen memory. It also sets up the SID sound chip to emulate the CB2 sound for PET programs.

In order to interpret Basic programs "on the fly," the Emulator must modify the CHRGET routine in low RAM to be able to intercept Basic commands before they are executed. This is a simple technique that was used first to implement the early versions of the DOS Wedge that ran on the PET.

The CHRGET routine is always called by Basic to read the next character in a Basic command line. By inserting a Jump instruction in the routine, another machine language routine like the Emulator can get control every time Basic tries to read another program command.

In playing with the Emulator, I found only one program that would not work, but that program used quite a few pokes and peeks and fancy techniques. The majority of programs I tried did work perfectly without any changes.

The sound effects are still good—sometimes even better. If you do have a PET system, you'll love being able to save on disk or tape programs that can be loaded and run (or listed) on the PET without doing any pokes to find the program.

Emulator Ability

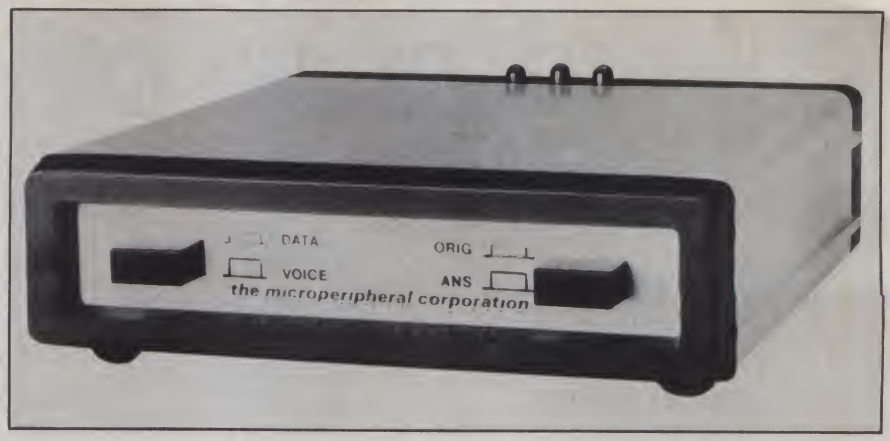
One of the Emulator's nice features is its ability to toggle the memory configuration and emulation modes. Thus, once you load the Emulator, you can switch back and forth between running C-64 and PET programs without having to reload the Emulator. Just remember that whenever you toggle the memory configuration, any program currently in memory will be lost.

The only disadvantages in using the Emulator are that you'll have a slight loss of program speed and that the screen is inverted from how the PET would display things. The C-64 is set up as having black characters on a white screen with a gray border. It's nice to look at, but the PET displays green characters on a black screen.

By the way, keep in mind that you lose some RAM space when emulating the PET. The PET has only 32K of RAM, with the screen memory just above program memory. When the C-64 is emulating the PET, you'll lose the extra 8K of RAM normally available. However, the Emulator doesn't steal any program memory space, since it resides in the unused 4K RAM space in upper memory.

Don't forget that you also get a copy of the DOS Wedge program included with the PET Emulator. The DOS Wedge and the PET Emulator load as one program.

With the DOS Wedge, you can easily perform routine disk functions in direct mode without using the command and error channel to the disk. You can display the disk directory without losing your program in memory and you can examine disk errors in direct mode. All of this is done with simple short-form commands that can be used in direct mode or within your Basic programs. If you have a VIC-1541 disk, you shouldn't be without a copy of the DOS Wedge, either with the Emulator or a stand-alone copy.



Microperipheral Corp.'s low-cost modem for VIC-20 and Commodore-64 computers.

More Commodore-64 Software

Commodore's Speed/Bingo Math cartridge lets you have hours of fun while you build basic math skills at the same time. Speed Math gives you mathematical problems in addition, subtraction, multiplication and division. Some are hard, some are easy.

The trick is to solve each problem by filling in a blank with the correct answer in ten seconds. There are 30 problems per round; they can be mixed or of one category.

Bingo Math puts your skills to the ultimate test. This action-packed, two-player game asks you to solve math problems and use the answers to score Bingo.

A math problem is displayed along with a number of answers on a "bingo card." Joysticks or the keyboard are used to move to the correct value. Once positioned, press the shift key on your side of the keyboard to enter your answer. If you get the right answer within five seconds and beat the opposing player, you get a marker in that square. Get five markers in a row for Bingo and you win.

EasyScript: C-64 WP

EasyScript is a super word processor for the C-64. Functionally, it's identical to SuperScript (written by Precision Software, Ltd.) for PET and CBM systems. If you remember, I reviewed SuperScript in the March column and mentioned that EasyScript was coming.

Well, EasyScript has been shipping for some time, and it's worth looking at. Early versions were supplied on disk while the final version will be a cartridge. The minimum system for using EasyScript includes the C-64 plus a VIC printer (1515, 1525, 1526 or equivalent), a display monitor or television and a C2N cassette or VIC-1541 disk.

EasyScript is almost identical to SuperScript, except that it makes use of the added C-64 function keys. The functions available in both packages are similar.

This is truly a full-function, professional word processing package that Commodore plans to market at an exceptional price. As its name implies, EasyScript is extremely easy to use and will handle even the toughest word processing chores.

As I said in my earlier SuperScript review, the documentation from Precision Software is superb. It's broken up into training, reference and appendix

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sections, with a useful index and plenty of examples.

Protecting the Neutral Zone

Neutral Zone, a C-64 cartridge game from Access Software, is normally supplied on disk or tape, with a protection "dongle" that plugs into the front joystick connector. A single joystick is required; it plugs into the second joystick connector.

The object of the game is to protect Alpha IV from destruction. Your gunnery pod has a 360-degree view as your ship travels through space. Your ship and the Alpha IV base can take a limited number of hits from the alien spacecraft; you must decide whether to concentrate on stopping the enemy fire or going all out in your efforts to defend the base ship.

The game can be played by one or two players, with two players taking turns instead of competing directly. There are five levels of play, each with an increasing number of enemy ships to destroy.

Your ability as a commander is analyzed and computed whether you win or lose. In order to increase your ranking, you must be quick as well as accurate.

The program is written in 100 percent machine language and features smooth scrolling of the 360-degree panorama. All action is in 3-D high-resolution, full-color graphics and fantastic sound effects. In fact, the graphics displayed by this game makes it one of the best I've seen for the C-64. And for you dealers, if left unattended for about a minute, the game will enter an attract mode and play by itself.

For more information, see your local dealer or write Access Software, 925 E. 900 S., Salt Lake City, UT 84105.

Misc

Commodore Business Machines recently participated as the exclusive computer sponsor in the 1983 Olympics of the Mind World Competition held at Central Michigan University in Mt. Pleasant, MI. Commodore provided 20 VIC-20s and a computer problem for competing student teams to solve. Commodore also provided two 8032 computers for registration, scheduling and scoring.

Approximately 300 teams representing schools from across the U.S. participated in three divisions. About one third of those participating attempted to solve the Computer Black Box Problem created by Mark Odgers of Commodore. The first-place teams were: Harry Spence School (WI) in Division I (elementary grades), Alice Birney School (SC) in Division II (middle school grades) and Revere High School (OH) in Division III (high school grades). The coaches of the winning teams were awarded plaques, and each placing team member received an Olympics of the Mind medal.

Olympics of the Mind

The Olympics of the Mind Association, Inc., is a private, nonprofit corporation with a Board of Directors representing several states. To participate in the OM World Competition, a team first must win local contests. Conceived and organized in 1978 by Dr. Ted Gourley, Director of Gifted Education, New Jersey State Department of Education, and Dr. C. Samuel Miklus, professor of Industrial Education and Technology at Glassboro State College in New Jersey, the OM program is designed to encourage young people to develop techniques in creative problem-solving. The program also aids teachers in enhancing the regular school curriculum.

Both a long-term and a spontaneous computer problem will be included as part of the 1984 competition.

Inexpensive VIC-20, C-64 Modem

The Microperipheral Corp. recently announced a low-cost modem for VIC-20 and C-64 computers. The unit features

both an autodial and autoanswer capability. In addition, it has a built-in Centronics-compatible parallel printer port.

The new product, called an AutoPrint-Microconnection, retails for $149.95 and is enclosed in an extruded aluminum case. It operates at 300 baud (Bell 103) in either originate mode or answer mode, and it's FCC Type Accepted. The combination modem and printer interface plugs directly into the computer without the need for additional interface devices. Telecommunications software is provided in the user manual.

The printer port permits the connecting of conventional parallel printers, such as the Epson and Okidata models. With the modem connected to the phone line, the printer will provide hard copy of whatever appears on the screen. Word processing software that routes text to the printer via the modem is available.

The unit measures 5 × 6 × 2 inches and weighs two pounds. For additional information, contact The Microperipheral Corp., 2565 152nd Ave. N.E., Redmond, WA 98052.

Wall Street Wizardry

(M)agreeable software, inc., recently released a program called Stock Helper to aid in tracking the ups and downs of the stock market. It was designed and written by a weekend investor for other weekend investors; it allows you to maintain on disk a history of stock prices and market indicators.

Stock Helper is a menu-driven tool that displays charts and calculates moving averages over a 52-week period. Stock Helper does not give you advice on when to buy or sell, it only collects and displays data to help you make your decisions. Stock Helper's features include:

- Input and editing of up to 52 weeks of high, low, close and volume data for up to 100 stocks.
- Input templates to match the data available for the particular stock according to its market.
- Input of prices in fractional form (23 7/8), decimal form (23.88), or in "eighths" form (23*7).
- Input and editing of up to 52 weeks of data for up to 20 market indicators. Types of indicators include advance/declines, averages and volumes.
- Display of price and indicator charts on a screen or printer, calculating moving averages for a user-selectable span.
- Splitting of stock prices or editing of names and symbols.
- Sorting stocks by market and by name, and sorting indicators by name.

Stock Helper is available for the C-64 and VIC-20. Original pricing was $30 in the U.S. and $37 in Canada, plus shipping. The software will be supplied only on disk; no cassette versions are planned.

For more information, write (M)agreeable software, inc., 5925 Magnolia Lane, Plymouth, MN 55442.

C-64 Product Guide

Looking for a product resource guide for your C-64? *What's for the 64* is just that—a book devoted to products available for use on the C-64. This isn't a mail order catalog, but a directory of sources strongly supporting the C-64 in all areas.

There are more than 125 pages listing programs and software, user groups, peripherals, interfaces, book titles and magazines catering to the C-64. There's also a bibliography of articles and programs written since the inception of the C-64. Cost is $15, plus $2 shipping, from *What's for the 64*, 3494 Chickasaw Circle, Lake Worth, FL 33463.

Leading Edge's GX-100P

Leading Edge Products recently announced its new Gorilla Banana printer (the GX-100P) for the VIC-20, C-64 and other popular small computer systems. This 80-column, 5 × 7 dot matrix printer has a print speed of 50 characters per second. It also has three print modes: normal print (ten characters per inch), double-width print (five characters per inch) and dot-addressable graphics. The GX-100P, which costs $249, features easy top-rear paper loading and a tractor feed paper transport mechanism for 4.5- to ten-inch-wide forms.

> . . . Commodore released about 70 software packages at the Consumer Electronics Show in Chicago; each package is priced under $100 retail.

You can even get a graphics cartridge for the VIC-20 so you can print all the PET graphics just like on the Commodore printer. List price of the graphics cartridge is $29.95, but you'll also need the interface cable, which is another $24.95. These should be available from a large number of computer dealers; watch for more details in the coming months.

Newsletter Gossip

From the CHUG June 1983 newsletter comes word of several changes (which I hadn't heard of from Commodore) in the VIC-20.

The latest VIC version uses the same power supply as that used on the Commodore-64, supplying 9 V of ac and +5 V of regulated dc. The 2114 RAM chips were replaced with CMOS 6116 RAM chips, with a corresponding drop in power consumption.

These changes result in a cooler-running machine and a printed circuit board that's two inches shorter, front to back. With less heat being produced, the big anodized aluminum heat sink was replaced with a small sheet-metal cartridge guide formed around the memory expansion edge connector.

Software News

According to a recent issue of *The Wall Street Journal*, Commodore released about 70 software packages at the Consumer Electronics Show in Chicago; each package is priced under $100 retail. Many of the programs appear to be those previously announced at other computer shows, while there are a few new items worthy of mention.

The new software includes word processors, financial planners, talking games, a music composer and adventure games. New educational software includes a Commodore version of Logo, as well as new computer-based software to teach English, math, science and history.

Commodore also is going to offer a low-priced software product called Magic Desk. This package appears to compete with Apple's Lisa office automation package, with "icons," or color pictures, to select desired functions.

The program displays full-color pictures of a desk, typewriter, index file, waste basket and other office equipment. Simply point to the desired item with an electronic pointing device and the computer switches to that program function. For example, by pointing to a file cabinet, the computer will store material.

Magic Desk is said to begin delivery in early fall with a price of under $100 retail.

Commodore also said it will supply a version of Multiplan for less than $100 retail. This electronic spreadsheet program, developed by Microsoft Corp. of Bellevue, WA, is heavily used on IBM PCs.□

LETTERS TO THE EDITOR

In Search Of a User's Group

I have been a follower of your "What's New, Big Blue?" column since its inception in October of last year. I have noticed your reference to an IBM PC user's group in New York City. Do you know of any user's groups here on the west coast, preferably in San Francisco or even better, in Santa Rosa?

Richard H. Hull
Santa Rosa, CA

Reply:

Richard, we know of at least one IBM PC user's group in the San Francisco area. Try contacting James Bunker, 1275 Columbus, San Francisco, CA 94133.

Editors

Aw, Shucks

This letter of appreciation can be delayed no longer. This morning, as I used MEMPEEK.BAS (March *Microcomputing*, "What's New, Big Blue?", p. 16) to find the exact location of a graphics display, I knew it was time to thank you for the fine articles in *Microcomputing*.

Your Text Editor [January *Microcomputing*, "IBM MVP (Most Valuable Program)," p. 64] is used daily, even though I also have Easy Writer, WordStar and WordMate.

Harold M. Jenkins
Norwalk, CT

Recategorizing Advertising Suppliers

I am a regular reader of several computer magazines, including *Microcomputing*. I read computer magazines for two purposes: to find out more information about machines that I already use (via software and hardware articles), and to find suppliers for various computer peripherals and software.

The second purpose is more important than the first, as the computer magazines represent what is really the only up-to-the-minute source of what types of computer products are currently available.

The problem with using computer magazines to find suppliers is that everything is too hard to find. The advertisers' index helps, but who knows what a company called Xibmic, or something like that, is actually trying to sell?

What is needed is a product index. That way, if someone is looking for a plotter, for example, you can look under the header for plotters and find the manufacturers that sell them.

Categories can be broken up further by listing for which machine the product is designed. For example, under Disk Drives, you could have Apple Disk Drives, Atari Disk Drives, and so on.

Mike Lombardi
Boulder, CO

Reply:

Thanks for the suggestion, Mike. We plan to implement the idea in future issues.

Editors

A Quirk in CoCo Basic?

Being an avid TRS-80 Color Computer fan and user, I found "The Computer That Roared" article in your May issue (p. 82) to be of great interest. More hardware details on the Dragon would be interesting.

The author stated that the Dragon and the Color Computer will not accept defined variables as starting points in for. . . next loops. The Color Computer will do so if the "TO" is preceded by a space or the variable is surrounded by parentheses.

The following are examples of routines that will and will not work:

```
10 INPUT"C";C:FORI=CTO10:?I;:NEXT
(This will not work because it needs
space before "TO".)
10 INPUT"C";C:FORI=C TO10:?I;:NEXT
(This is OK—note space.)
10 INPUT"C";C:FORI=(C)TO10:?I;:NEXT
(This is OK—note parentheses.)
```

This seems to be a quirk in the Microsoft Color Basic in the Color Computer. The "TO" must be preceded by a number or a delimiter. In the cases illustrated above, the space and the parentheses are delimiters and create no problem for the program. The quirk occurs elsewhere, so to avoid problems in these areas, you should conform to the following when using defined variables:

For. . . to. . . next. . . Step statements—precede "TO" and "STEP" with a space.

If. . . then. . . else statements—precede "THEN" and "ELSE" with a space.

On. . . goto and On. . . gosub statements—precede "GOTO" and "GOSUB" with a space.

Please keep in mind that, although the number 1024 and the statement "&H400" represent the same value, the statement "&H400" falls under the same rule as a variable and must be enclosed in parentheses or followed by a space, as in this example:

```
10 FORX=&HA000 TO&HBFFF:?CHR$
(PEEK(X));:NEXT
(This is OK—note space.)
```

I hope this will benefit some of the CoCo and Dragon users.

Howard B. Culbreth
Tabb, VA

Where Can IBM Users In Cleveland Go?

An IBM Personal Computer User's Group has been formed in Cleveland, OH. Our first meeting was held in November 1982 with 20 PC users present. At the January 1983 meeting we approved a set of by-laws and elected a board of directors. In February, we started publishing a monthly newsletter called *PC Chronicles*.

We meet at the Beachwood Public Library on the first Saturday of each month at 2 p.m. Everyone is welcome.

Our objective is to educate our members in the use of the IBM PC and similar machines. We discuss hardware and software, each month focusing on a particular topic. We help the new member learn how to use his machine.

We also have a book library and a collection of public domain programs.

We'd like to exchange newsletters with other PC groups.

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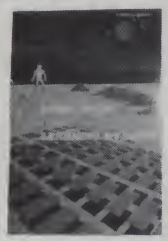
Order #164 **$7.95**

Games for the ATARI Computer
This book describes advanced programming techniques like player-missile-graphics and use of the hardware-registers. Contains many ready to run programs in BASIC and one called GUNFIGHT in machine language.
Order #162 **$7.95**



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SOFTWARE IN BASIC FOR ATARI

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This program makes writing invoices easy. Store your products in DATA statements with order-number, description, and price. The program later retrives the description and price matching to the entered order-number. The shipping cost and the discount may be calculated automatically depending on the quantity ordered or entered manually. The description to the program tells you how to change the program and adapt it to your own needs. Comes with a couple of invoice forms to write your first invoices on to it.
Order #7201 cassette version **$29.95**
Order #7200 disk version **$39.95**

Mailing List
This menu driven program allows the small business man to keep track of vendors and customers. You can search for a name or address of a certain town or for an address with a certain note. 50 addresses are put into one file.
Order #7212 cassette version **$19.95**
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Inventory Control
This program is menu driven. It gives you the following options: read/store data, define items, entry editing, inventory maintenance (incoming-outgoing), reports. The products are stored with inventory number, manufacturer, reorder level, present level, code number, description.
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This is a machine language monitor that provides you with the most important commands for programming in machine-language. Disassemble, dump (hex and ASCII), change memory location, block transfer, fill memory block, save and load machine-language programs, start programs. Printer option via three different interfaces.
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Order #7023 disk version **$24.95**
Order #7024 cartridge version **$59,00**

ATMONA-2
This is a tracer (debugger) that lets you explore the ATARI RAM/ROM area. You can stop at previously selected address, opcode, or operand. Also very valuable in understanding the microprocessor. At each stop, all registers of the CPU may be changed. Includes ATMONA-1.
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Macro-Assembler for ATARI-800/48k. One of the most powerful editor assemblers on the market. Versatile editor with scrolling. Up to 17k of source-Code. Very fast, translates 5k source-code in about 5 seconds. Source code can be saved on disk or cassette. (Includes ATMONA-1)
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Same as ATMAS but without macro-capability. Cassette-based.
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This wordprocessor is an excellent buy for your money. It features screen oriented editing, scrolling, string search (even nested), left and right margin justification. Over 30 commands. Text can be saved on disk or cassette.
Order #7210 cassette version **$29.95**
Order #7216 disk version **$34.95**
Order #7217 cartridge version **$69.00**

GUNFIGHT
This game (8k machine-language) needs two joysticks. Animation and sound. Two cowboys fight against each other. Comes on a bootable cassette.
Order #7207 **$19.95**

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Keep Your Selectric Shipshape

If you have an IBM Selectric typewriter hooked up to your micro, then you'll want to follow these simple repair and maintenance procedures to get the most out of your Selectric printer.

By Mark Waller

I had been repairing Selectric typewriters for IBM for about four years when the microprocessor was invented. Many years later, when I purchased a microcomputer, one of my first priorities in a printer was print quality. Because of this, and because of my background, I bought a modified Selectric.

My years as a customer engineer with IBM have taught me some maintenance tips and two important adjustments that must be made occasionally to keep a Selectric up to snuff.

Anyone who is using a computer to drive one of these beasts knows they're slow—at 120 words per minute, they're being pushed to their mechanical limit. And what happens when you push something to its limit?

Parts break or wear out on a Selectric just as on any printer. Many have said that the Selectric isn't built to take the abuse a computer can give it.

Based on experience, I beg to differ. The speed limit is a result of timing—the setting and resetting of various submechanisms—not on the quality of the parts. Where reliability and quality are concerned, the Selectric is among the finest machines built by American industry.

Dos and Don'ts

Most problems with Selectrics are caused by normal wear and operator abuse. Normal wear can be countered with a few adjustments. However, if you insist on repainting your machine with "white-out" or filling it with erasures, then you're headed for trouble. But if you connect it to your computer and leave it alone, except to feed in paper and set margins, you should have little trouble.

Your Selectric almost never needs lubrication, so put your oil can away. Excessive lubricant traps dirt and dust and will gobble up even the toughest moving part.

Your Selectric rarely needs cleaning, either. Keep the plastic cover over it when it is not in use, and the keyboard and the rest of the machine will stay clean.

You may notice two plastic dust covers underneath the print carrier. Keep your hands away from them! Even if they look dirty, leave them alone. I realize everyone wants a clean machine, but a closer look will reveal the tilt and rotate tapes nearby. If these are knocked off of their pulleys, you may damage or break them. Neither of these parts is much fun to replace. In fact, a skilled technician may go through a couple of rotate tapes before he's done replacing one.

The type element (ball) also needs little attention. This is because most high-quality ribbons are plastic-backed and will leave no residue on the element. With some carbon ribbons, you may find certain letters filling in, especially the O and the A. This may be caused by a high impression setting—the little red knob next to the element could be set too high. A setting of 1 gives the lowest impression and 5 gives the highest.

Not Ribbin'

More frequently, filled-in letters are the result of cheap ribbon. The backing of the ribbon is perforated by the letter on the element and becomes embedded inside the letter, just like a cookie cutter. Take a pin and gently pry out the debris, and you're set.

If you use a fabric ribbon, you may have to clean the element with solution to get the ink off, but this is rare on the newer models. Carbon ribbon produces the finest letter quality, and fabric ribbon is the least expensive because the ribbon is printed on over and over.

An excellent compromise for Selectric IIs is the Tech III, a fabric-type ribbon that overstrikes as it advances. The print quality of the Tech III is almost as good as carbon.

The Tech III is several times more expensive than carbon ribbon, but it'll last months longer. Any office supply house carries Selectric ribbons.

Occasionally, inexpensive ribbon can become wrapped around the spiked driver on a Selectric II. The

Address correspondence to Mark R. Waller, 585 Woodcrest, Springfield, OR 97477.

spike driver advances the ribbon and is seen directly in front of the print element with the ribbon removed. Should this happen, break open the ribbon cartridge and pull the old ribbon out.

On a Selectric I with carbon ribbon drive, make sure the ribbon is placed between the feed rollers, or you'll use it five times too fast and waste expensive ribbon.

One common complaint dealing with print quality is dirty print. Often, this is caused because the multiple copy control lever is set back. The copy control lever is on the left rear of the top cover. The settings are A through E. Older machines may not have letters next to the lever.

Move the lever rapidly back and forth while watching the platen. You will see that the platen moves with the lever; this is so the print angle will change when many sheets of paper are in the machine. If you have the copy lever back, you have changed the angle and the element will strike the paper slightly at an angle. This will cause sloppy printing, and the bottom portion of the letter may print immediately over the selected letter.

No Sheet

It is not recommended that a backing sheet be used. This throwback from the manual days will cause problems similar to those previously mentioned.

Tilt and rotate adjustments must be made as the machine wears. When a letter is depressed on the keyboard or actuated by the computer, the print element must tilt and rotate to the proper position.

The timing of this is critical and the associated adjustments do not have to be far off to cause a problem. These malfunctions manifest themselves by printing portions of letters askew.

Replacing the Print Element

If this occurs, take off the element and look at the teeth on the underside. Often, a broken tooth is the culprit. Do not try to glue the element. It is under great stress, and when a tooth is broken, the entire element must be replaced.

Newer elements are removed by lifting the tab on the top. Older elements have a spring wire release. Just squeeze the wires together and it will come off.

Checking the Rotate Adjustment

If the element appears OK, check the rotate adjustment. To do this, remove the cover and place the carrier in the middle of its range of movement. Then lift the top cover and reach in on each side and pull the levers back. (Older models use four swivel-type brackets accessible after the bottom cover has been removed.)

Pull the paper release lever forward, and remove the platen by depressing the levers on each end of it. The levers are between the platen surface and the knob at the end. To replace the platen, position it and pop it in. You might try this a couple of times to get the feel of it.

Under the platen is a long, curved piece of silver metal called the paper deflector. Remove this and replace it with the platen.

Unplug the machine and turn on the power switch. Next, type the letter T. Find the metal bar that the print carrier moves on, and rotate it toward the platen. You should be able to turn it that way only.

Rotate the bar until the element is close to the platen as it travels through its movement. You may rotate the bar back and forth at this point to see where the closest spot is. This is the "half-cycle" position.

Continuing the rotation of the bar causes the print cycle to restore, ready to print another letter. This hand-cycling simulates actual print operation. With the element in the half-cycle

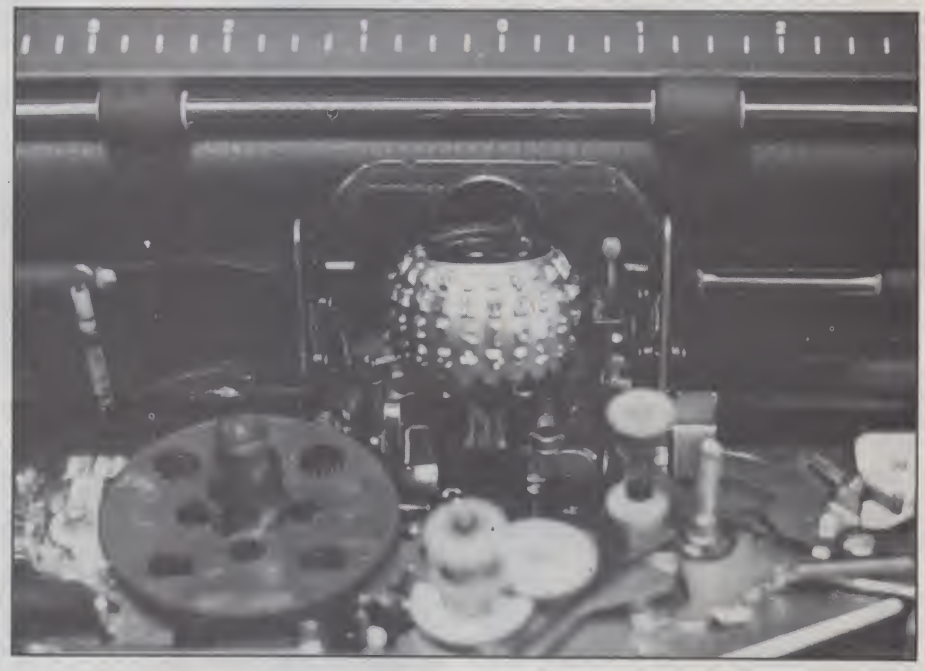


Photo 1. The round object in the center of this photo is the element. To its right is the impression control lever.

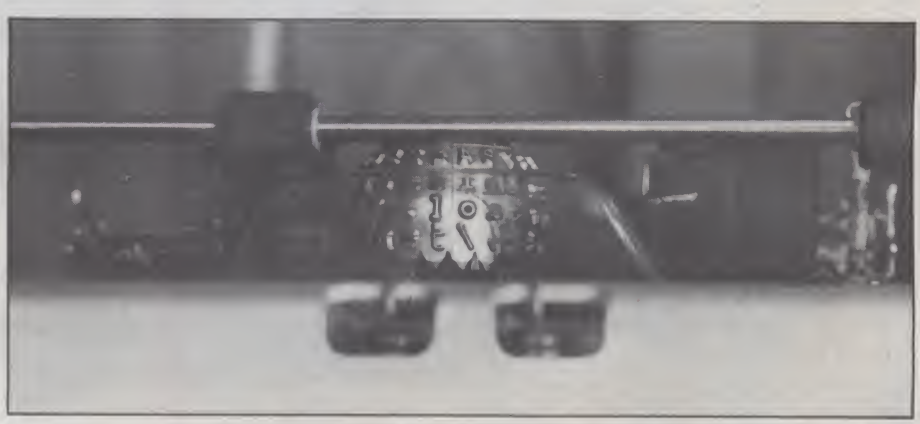


Photo 2. With the lowercase J half-cycled, the detent can be seen directly below the slash key.

position, the desired character has been locked into place and is pressing the ribbon to the paper against the platen.

The element is positioned by the tilt and rotate tapes, and then locked in. In front of the element, to the right, is the detent lever. Place your right thumb on the front of the element and gently try to rotate it. It should have little "play" (free movement with no spring tension) to it.

Now take your left index finger and gently pull the detent lever to the left; you'll be able to move the element. A rule of thumb is that the play to the right should be roughly equal to the play to the left. To check this, pull the detent lever.

This adjustment can be seen by turning the machine around and removing the platen. When you "half-cycle" a lowercase J, you'll see the detent slip between the element teeth under the slash key, which is the character to the right of the J (see Photo 2). With the machine in this position, you can easily determine if the play is equal to both sides of the detent.

If you have a rotate problem, you'll find plenty of play one way but little the other. This means the element is not locking in properly during the print cycle.

Check Tilt

To check the tilt adjustment, take the print element off and turn the machine so it's facing you. Then half-cycle a T.

Pull the detent lever to the left and check the play of the printhead. Again, you should have equal play when you tilt the head both ways (toward the front and toward the rear of the Selectric).

So you've discovered a maladjustment; by now, you're sweating and wondering if this is all worth it. Believe me, it is. To have a service call to do this may cost you $75 or more.

The Rotate Adjustment

Rotation is adjusted easily from under the machine. To get at it, you need to lift the machine in the bottom cover. On the left side near the bottom is the machine release. Gently pull

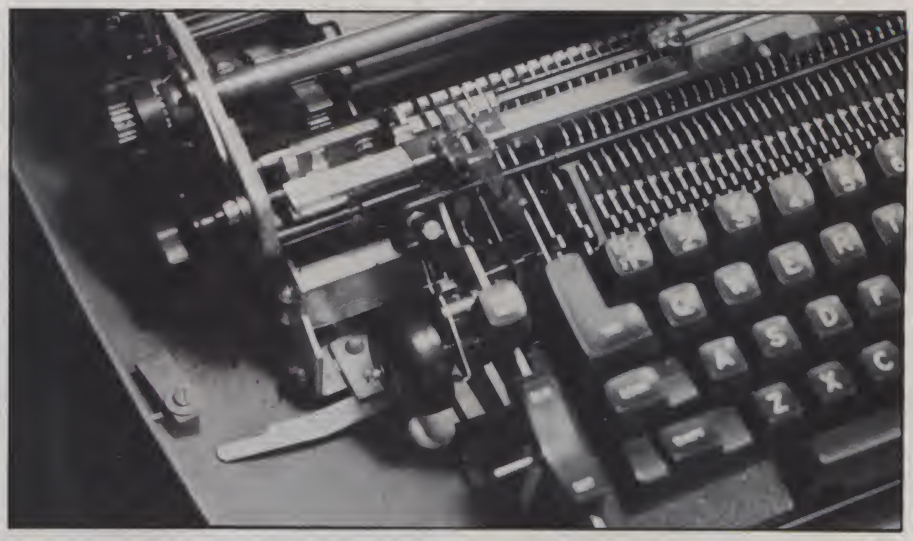


Photo 3. The machine release lever is directly under the margin bell.

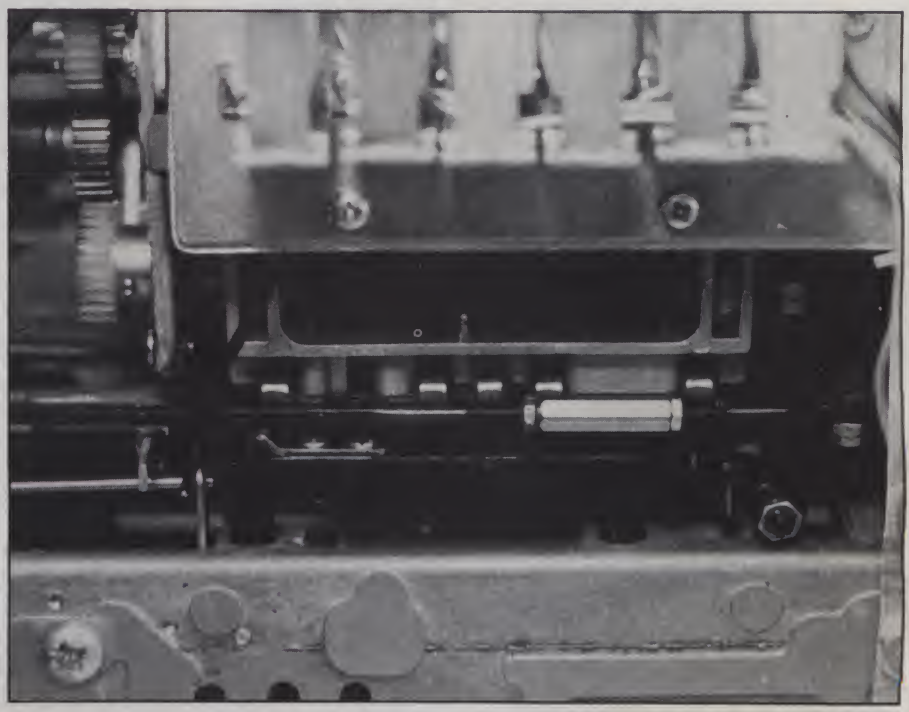
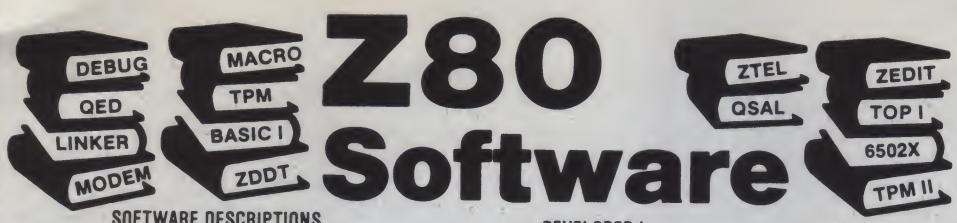


Photo 4. The rotate adjustment turnbuckle is shown. On older models this turnbuckle may be positioned further to the left.



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Includes: TPM-II ($125), Sample PIOS (BIOS) SOURCE (SFREE), MACRO II ($100), MACRO III ($150), LINKER ($80), DEBUG I ($80), DEBUG II ($100), QSAL ($200), QED ($150), ZTEL ($80), TOP II ($100), BUSINESS BASIC ($200) and MODEM SOURCE ($40) and DISASSEMBLER ($80)
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This package is only for the TRS-80 Model I. Note: These are the ONLY CDL programs available for the Model I. It includes: TPM I ($80), BUSINESS BASIC ($200), MACRO I ($80), DEBUG I ($80), ZDDT ($40), ZTEL ($80), TOP I ($80) and MODEM ($40)
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Includes: QSAL ($200), QED ($150), BUSINESS BASIC ($200), ZTEL ($80) and TOP II ($100)
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Circle 18 on Reader Service card.

it toward you.

On both sides of the front of the keyboard are small rods. They're located in the middle of the tab set and clear button and the on/off button. Use these to pull the machine up and forward until it stops sliding in the bottom cover. Then tilt the machine up in its bottom cover as if you're opening a car hood. If this is done properly, the Selectric will rest upright with no support.

Toward the lower left of the machine, you'll see a long, dark rod with a turnbuckle on it (see Photo 4). The turnbuckle, held in place by a locknut on each end, adjusts rotation. Loosen the two locknuts but hold onto the turnbuckle at the same time or you may break the rod. That's just common sense.

To adjust the turnbuckle, rotate it one half-turn at a time. Then lower the machine and check your play. By trial and error you should find the proper setting within two turns.

Now check a half-cycled capital T as well. There should be a balance between upper- and lowercase letters. You may have to find a happy medium between them. Don't forget to tighten the locknuts when you finish.

To replace the machine in its bottom cover, tilt it down and push it back until it's seated in the two rubber grommets on the back of each side. Then push the release lever forward to lock it.

The Tilt Adjustment

The tilt adjustment is made on the tilt pulley. This is horizontally mounted just under the right end of the platen. The tilt pulley has a locknut on top of it and an adjusting screw on the side. Loosen the locknut and turn the screw one half-turn; then relock the nut and check the tilt play. You should find the proper setting within two turns.

Each time an adjustment is checked, restore the letter by hand instead of leaving it half-cycled. You also may want to check the uppercase T. The adjustments should change little between cases. You may have to find a "happy medium" between the two. There is a balance adjustment for upper- and lowercase, but it's difficult to make and it's generally unnecessary.

An even finer adjustment should be made by checking J and W. These are the extremes of the tilt positioning.

When you replace the top cover, remember to remove the platen and flip back the margin levers and the red pointer on the carrier. Replace the cover and push the cover release levers back. Flip the margin levers and pointer down. Put the ribbon back in. Before you replace the platen, make sure the paper deflector is seated properly.

Expendable Secretary

The adjustments I've discussed here are not factory specifications. The adjustments on a Selectric are made within .001 of an inch in some submechanisms, but, for general purposes, even qualified technicians use rough estimates.

I've been using my microcomputer/Selectric combo for several years now, and I've had little problem with the Selectric itself. And I don't mind waiting for it to chug out my next manuscript, for the print it turns out is a thing of beauty. Using the Electric Pencil word processor with my TRS-80 and my Selectric II gives me the largest office staff I'll ever need. ■

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Say It in Bar Code

Bar none, the use of bar codes to store information is fast becoming an exciting new technology. This VIC-20 program that turns your printer into a bar code generation machine is a real bar-gain.

By Joseph Verzino

Recent developments in bar coding, particularly by supermarkets—the use of the universal product code (UPC), bar code labels and bar code scanners—have spurred tremendous interest in bar code applications. This article describes a bar code technique that you can use with any Basic language computer and any dot matrix printer with graphics capability. I used the VIC-20 with a C-Itoh 8510 ProWriter serial printer attached to the RS-232 user port. The printer is used in the bit image graphics mode.

Your printer must be able to print a vertical line of "dots" to represent a bar and a vertical line of "no dots" to represent a space. The program included here shows you how to control the printer to make it behave as a bar code printer.

The program demonstrates a simple means of generating and printing a "straight 2-of-5" (two of the five bars are wide) bar code representation of any number up to ten digits long.

I chose the straight 2-of-5 bar code because it is an easy code to generate, and only the numbers 0 to 9 are in the character set. It is necessary to be able to print a space, a bar and a wide bar to generate the bar code of any character. A wide bar is made by printing three successive narrow bars. A character is made up of exactly five bars, of which two are wide bars.

Bars and Stripes Forever

Table 1 shows the bar codes of the ten characters and the start and stop codes. In the binary code representation, a bar is 0 and a wide bar is 1. All characters, including the start and stop characters, start with a bar and end in a space. This last space is an intercharacter gap, which could be made wider if desired.

The start and stop codes are required by the bar code reader and are used to let the reader's decoder know whether the bar code is being scanned left to right or right to left. All numbers must contain a start code at the left side and a stop code at the right side. There should also be a Q space (quiet zone) before and after the number. For example, the number 983 is generated as Q(START)983(STOP)Q.

To generate the bar code of a number, a set of subroutines is used to

Joseph Verzino is a research engineer at the Syracuse Research Corp., Merrill Lane, Syracuse, NY 13210.

CHARACTER	BINARY CODE 1 2 4 7 P	BAR CODE
0	0 0 1 1 0	
1	1 0 0 0 1	
2	0 1 0 0 1	
3	1 1 0 0 0	
4	0 0 1 0 1	
5	1 0 1 0 0	
6	0 1 1 0 0	
7	0 0 0 1 1	
8	1 0 0 1 0	
9	0 1 0 1 0	
START	0 0	
STOP	1 0	

Table 1. Straight 2-of-5 bar code.

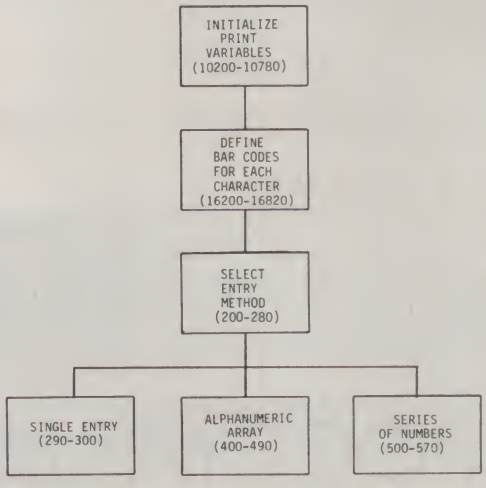

Fig. 1a. Main program of functional flowchart for straight 2-of-5 bar code generator.

generate the Q, the start and stop code and the individual character bar code setup that specifies 14 print cells in a character. In Table 1, the 14 cells can be seen as five blank space cells, three narrow bar cells and two wide bar elements of three cell widths each. Note also in Table 1 that a start code is four cells wide, while a stop code is six cells wide. The quiet zone (Q) was previously defined to be ten cells wide.

A functional flowchart of the program with line numbers is shown in Fig. 1a. The first step after opening file 2 on port 2 (line 100) is to jump down to line 10200 to initialize the print variables. Line 10230 sets the vertical height of the bars at three lines high. If your ribbon is old, you may want to print each line twice to darken the bars. This is done in line 10235.

Line 10240 establishes the two string characters for printing a single vertical bar, B$=CHR$(255), and a single vertical space, S$=CHR$(0).

If your ribbon is old, you may want to print each line twice to darken the bars.

The CHR$(255) sets all eight bits of a byte to ones (11111111), the vertical line of "dots," while CHR$(0) sets all the bits of a byte to zeroes (00000000), the vertical line of "not dots."

Line 10400 sends CR, LF, ESC,! to the printer to set up bold (darkened) print. Line 10600 sends ESC, T, 16 to eliminate the spaces between lines in the vertical direction. Thus, the same code printed on three successive lines *will touch* one another, thereby establishing the bar code height at three lines high (remember line 10230).

For purposes of clarity for this article, I defined a narrow bar as two vertical lines wide, as in line 10760, where two B$s are concatenated to form BN$, a narrow bar. In line 10770, a wide bar, BW$, is the concatenation of three narrow bars. In line 10780, a narrow space, SN$, is the concatenation of two S$ vertical spaces.

After the initialization of the print variables, the bar codes for each character are defined by filling the P$ matrix for the characters 0 to 9 in lines

Listing 1. Straight 2-of-5 bar code generator program for the VIC-20.

```
1 REM STRAIGHT TWO OF FIVE BAR CODE GENERATOR
2 REM J VERZINO  BOX 265 DEWITT,NY 13214
3 REM  THIS PROGRAM GENERATES 2 OF 5 BAR CODES USING A C-ITOH 8510 PRINTER.
4 REM  THE HEIGHT OF THE BAR CODE GENERATED IS CONTROLLED BY NV IN LINE 10230.
5 REM  TO DARKEN THE BAR CODE OUTPUT, NP, IN LINE 10235 MUST BE SET HIGHER.
6 REM  THE START AND STOP CODES ARE SUPPLIED BY THE PROGRAM.
7 REM  THERE ARE THREE TYPES OF ENTRY:

8 REM
9 REM    S     MEANS SINGLE ENTRY, WHERE CODE IS GENERATED AFTER DATA INPUT
10 REM
11 REM   A     MEANS ARRAY ENTRY. AN ARRAY OF NUMBERS ARE INPUT BEFORE PRINTING
CODES.
12 REM
13 REM   N     MEANS INDEXED NUMERIC ENTRY. FIRST,LAST AND INCREMENT ARE ENTERED
.
14 REM  THE  @  SIGN IS USED TO INDICATE END OF ENTRY
30 REM C-ITOH SWITCH SETTINGS
31 REM SW1 2,6,7 CLOSED
32 REM SW2 1,7,8 CLOSED
33 REM SW3 1,3   CLOSED
34 REM SW4 1,3,4,5,8 CLOSED

44 REM
45 REM  NUMBER BINARY CODE
50 REM     0   00110
51 REM     1   10001
52 REM     2   01001
53 REM     3   11000
54 REM     4   00101
55 REM     5   10100
56 REM     6   01100
57 REM     7   00011
58 REM     8   10010
59 REM     9   01010
60 REM WEIGHTS 1247P
81 REM BARS=B1 TO B5   SPACES=S. ANY BAR CODE OF A NUMBER HAS THE FORM:
82 REM                 B1 S B2 S B3 S B4 S B5 S
83 REM ALL FIVE SPACES ARE SINGLE WIDTH WHITE CELLS (5 WHITES).
84 REM 2 OF 5 BARS ARE 3 BLACK CELLS WIDE, THE OTHER 3 ARE 1 BLACK CELL WIDE(9 B
LACKS).

85 REM EACH CHARACTER HAS A TOTAL WIDTH OF FOURTEEN CELLS: 5 WHITE, 9 BLACK
86 REM ONLY THE BARS ARE CODED, WITH A 1=TRIPLE BLACK CELL AND A 0=SINGLE BLACK
CELL.
87 REM THE START CODE IS 4 CELLS WIDE, AND IS:   B1 S B2 S, CODED 00 (BINARY).
88 REM THE STOP CODE IS 6 CELLS WIDE, AND IS:   B1 S B2 S , CODED 10 (BINARY).
89 REM  THE PROGRAM INSERTS THE START AND STOP CODES AUTOMATICALLY
90 REM
100 OPEN2  ,2,3,CHR$(134)
130 GOSUB10200
150 REM*************************************************************************

200 PRINT CHR$(147)     :REM CLEAR  SCREEN
202 PRINT:PRINT
205 PRINT"WHAT ENTRY METHOD?    (ENTER CHARACTER)       ":PRINT:
210 PRINT"(S) SINGLE ENTRY            ":PRINT
220 PRINT"(A) ARRAY OF NUMERIC CHARACTERS ":PRINT:PRINT
230 PRINT "(N) SERIES OF NUMBERS":PRINT:PRINT
240 INPUT"**ENTER S,A, OR N**"; Q$
250 :    :IF Q$="S"THEN  290
255 :    :IF Q$="A"THEN  400
260 :    :IF Q$="N"THEN  500
270 :    :IF Q$=""THEN   240
280 GOTO 200
290 PRINT"ENTER @ TO    STOP"
291 INPUT"ENTER NUMBER ";N$
292 IFN$="@"THENCLOSE2:STOP
293 GOSUB7020 :REM BREAK N$ INTO:
294 REM             N$=NC$(1)+NC$(2)+   ...+NC$(L)
295 GOSUB800 :REM THIS SUBROUTINE PRINTS BAR CODE WITH START AND STOP CODES
300 GOSUB290
350 REM*************************************************************************
400 PRINT"ENTER EACH NUMBER  FOLLOWED BY A RETURN. TYPE @ WHEN DONE"
405 I=1
410 INPUT NQ$(I)
425 IF      NQ$(I)="@"THEN 430
427 I=I+1: GOTO 410
430 FOR K1=1TOI-1
440 N$=NQ$(K1)
445 PRINTK1,N$
450 GOSUB7020
460 GOSUB800
470 NEXTK1
475 GOSUB7600
480 CLOSE2
490 STOP
495 REM*************************************************************************
500 PRINT"ENTER FIRST NUMBER, LAST NUMBER,INCREMENT"
505 INPUT NF,NL,DN
508 FOR K2=NF TO NL STEP DN
510 N$=STR$(K2)
512 L=LEN(N$)
514 N$=RIGHT$(N$,L-1)
520 GOSUB7020
530 GOSUB800
540 PRINTK2,N$
550 NEXT K2
555 GOSUB7600
560 CLOSE2
570 STOP
800 REM*************************************************************************
810 REM
820 REM LINES 900-990 LOAD PRINT ARRAY PP$
850 REM NL=NUMBER OF CHARACTERS IN NUMBER TO BE BAR CODED
```

More

16210–16290. Very conveniently, P$(0) is the print variable for character 0, P$(1) is the print variable for character 1, etc. A glance at the binary code at the end of each line shows the correlation of the 1s in the binary code with the wide bars, BW$, in the print variable.

The guts of this (bar code) program are contained in the subroutine at lines 7020 and 800.

The next step is to produce a menu and supply the logic to select an entry method, lines 200 to 280. If an "S" is selected, the single entry mode is activated in lines 290–300. In this mode, a number is entered and the printer starts printing it. When the printing is done, it asks for a new number.

Entering "@" closes the file and stops the program. If the "A" is selected, an array of numbers is first en-

Listing 1 continued.

```
860 REM PP$=ARRAY OF CHARACTERS IN NUMBER TO BE BAR CODED, PP$(1) TO PP$(NL)
900 FORK=1TONL
905 :  :FORI=0 TO 9
920 :       :IF NC$(K)=M$(I)THENPP$(K)=P$(I): GOTO 990
940 :  :NEXT I
990 NEXT K
999 REM************************************************************************
1194 REM
1500 FORI=1TONW:REM NW LINES VERTICAL
1550 :   :FOR J=1TONP:REM OVERPRINT CODE NP TIMES TO DARKEN PRINTOUT
1600 :   :GOSUB 7600:REM DELAY
2000 REM************************************************************************
2010 REM
2050 REM LINES 2500-3000 PRINTS A SINGLE LINE OF BARCODE
2060 REM
2500 :   :GOSUB5500:REM QUIET ZONE IS 20 VERTICAL LINES WIDE
2550 :   :GOSUB 5700:REM PRINTS                    A START CHARACTER
2600 :       :FORK=1TONL
2611 :       :GOSUB5200 :REM  CHAR SETUP
2621 :       :PRINT#2,PP$(K);:REM PRINT CHAR BARCODE
2630 :       :NEXTK
2950 :    :GOSUB 5750:REM PRINTS A STOP CHARACTER
3000 :    :GOSUB5500:REM QUIET ZONE IS 20 VERTICAL LINES WIDE
3005 REM************************************************************************
3900 :    :PRINT#2,CHR$(13);:NEXTJ
3950 PRINT#2,CHR$(13) CHR$(10)
4000 NEXTI
4010 REM************************************************************************
4020 REM
4030 REM LINES 4100-4900 PRINT NUMBER BELOW BARCODE
4040 REM
4100 PRINT#2,
4200 GOSUB 7600:REM DELAY
4600 PRINT#2,
4700 PRINT#2,
4800 PRINT#2, CHR$(13)CHR$(10)
4801 PRINT#2,"    ";
4802 FORK=1TONL
4804 PRINT#2,"  "NC$(K);
4806 NEXTK
4808 PRINT#2,"    ";
4810 PRINT#2, CHR$(13)CHR$(10)
4900 GOSUB 7600:REM DELAY
4940 PRINT#2,CHR$(10)CHR$(10)CHR$(10)CHR$(10):REM CHR$(10)=LINE FEED
4950 RETURN
```

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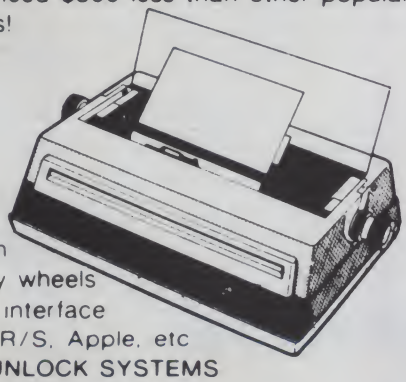

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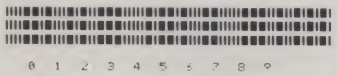
tered, then the printer starts printing them. This is done in lines 400 to 490. If an "N" is selected, a series of numbers is selected by entering a first and last number and an increment. The printer then begins printing. This is done in lines 500 to 570.

Nitty-Gritty

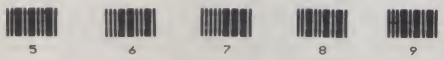
The guts of this program are contained in the subroutines at lines 7020 and 800. The subroutine at 7020 establishes the length of the string input, N$. Then it places each character into the NC$ array with the first character in NC$(1), etc. If you want to enter more than a ten-character number, NC$ must be dimensioned.

The subroutine at 800 actually prints the bar code. Fig. 1b shows the subroutines accessed by this printing subroutine.

Lines 900 to 990 fill the character print array PP$, from PP$(1) to PP$(NL). Line 1500 starts the DO loop on the number of vertical lines, and line 1550 starts the DO loop on the



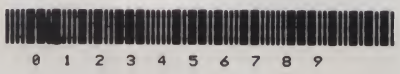
Bar code with lines uncompressed.



Bar code with lines compressed.

Listing 1 continued.

```
 5010 REM*************************************************************************
 5200 REM CHARACTER SETUP                                    ESC S 0028
 5202 PRINT#2,CHR$(27)CHR$(83)CHR$(48)CHR$(48)CHR$(50)CHR$(56);
 5210 RETURN
 5310 REM*************************************************************************
 5500 REM QUIET ZONE 10 SPACES
 5504 PRINT#2,CHR$(27)CHR$(83)CHR$(48)CHR$(48)CHR$(50)CHR$(48);
 5508 FORK=1TO20
 5510 PRINT#2,S$;
 5520 NEXTK
 5530 RETURN
 5610 REM*************************************************************************
 5700 REM START CODE
 5702 PRINT#2,CHR$(27)CHR$(83)CHR$(48)CHR$(48)CHR$(48)CHR$(56);
 5704 PRINT#2,BN$+SN$+BN$+SN$;
 5710 RETURN
 5750 REM STOP CODE
 5752 PRINT#2,CHR$(27)CHR$(83)CHR$(48)CHR$(48)CHR$(49)CHR$(50);
 5754 PRINT#2,BW$+SN$+BN$+SN$;
 5760 RETURN
 5810 REM*************************************************************************
 7000 REM GET NUMBER TO  CODE
 7020 NL=LEN(N$)
 7030 FORI=1TONL
 7040 NC$(I)=MID$(N$,I,1)
 7045 IF(NC$(I)<"0")OR(NC$(I)>"9")THEN PRINT"ERROR":PRINT: GOSUB7600:   GOTO200
 7050 NEXTI
 7060 RETURN
 7510 REM*************************************************************************
 7600 FORZ=1TO2000:NEXTZ:REM DELAY
 7610 RETURN
 8610 REM*************************************************************************
10095 REM START EACH 39 CODE CHARACTER WITH A SPACE
10100 REM 8 DATA/2 STOP BITS/300 BAUD
10190 REM*************************************************************************
**
10194 REM
10195 REM LINES 10200-10790 SET UP BARS AND SPACES
10196 REM
10200 REM INITIALIZE
10230 NW=3:REM 3 VERTICAL BARS
10235 NP=2 :REM PRINT TWICE TO DARKEN PRINTOUT
10240 B$=CHR$(255):S$=CHR$(00) :REM B$=SINGLE VERTICAL BAR, S$=SINGLE VERTICAL S
PACE
10300 REM CR,LF,ESC,BOLD INITIATES BOLD PRINTING (DARKENS PRINTOUT)
10400 PRINT#2,CHR$(13)CHR$(10)CHR$(27)CHR$(33);
10500 REM ESC,T,16 ELIMINATE SPACES BETWEEN LINES
10600 PRINT#2,CHR$(27)CHR$(84)CHR$(49)CHR$(54);
10760 BN$=B$+B$:REM NARROW BAR IS 2 VERTICAL LINES WIDE
10770 BW$=BN$+BN$+BN$:REM WIDE BAR (3/1) IS 6 VERTICAL LINES WIDE
10780 SN$=S$+S$:REM NARROW SPACE IS 2 VERTICAL LINES WIDE
10791 REM LOAD MATRIX P$ (PRINT CODES)
16198 REM*************************************************************************
16199 REM       FILL MATRIX AND SET UP P$ FOR PRINTING
16200 REM
16210 M$(0)="0": P$(0)=BN$+SN$+BN$+SN$+BW$+SN$+BW$+SN$+BN$+SN$:REM 00110
16215 M$(1)="1": P$(1)=BW$+SN$+BN$+SN$+BN$+SN$+BN$+SN$+BW$+SN$:REM 10001
16220 M$(2)="2": P$(2)=BN$+SN$+BW$+SN$+BN$+SN$+BN$+SN$+BW$+SN$:REM 01001
16230 M$(3)="3": P$(3)=BW$+SN$+BW$+SN$+BN$+SN$+BN$+SN$+BN$+SN$:REM 11000
16240 M$(4)="4": P$(4)=BN$+SN$+BN$+SN$+BW$+SN$+BN$+SN$+BW$+SN$:REM 00101
16250 M$(5)="5": P$(5)=BW$+SN$+BN$+SN$+BW$+SN$+BN$+SN$+BN$+SN$:REM 10100
16260 M$(6)="6": P$(6)=BN$+SN$+BW$+SN$+BW$+SN$+BN$+SN$+BN$+SN$:REM 01100
16270 M$(7)="7": P$(7)=BN$+SN$+BN$+SN$+BN$+SN$+BW$+SN$+BW$+SN$:REM 00011
16280 M$(8)="8": P$(8)=BW$+SN$+BN$+SN$+BN$+SN$+BW$+SN$+BN$+SN$:REM 10010
16290 M$(9)="9": P$(9)=BN$+SN$+BW$+SN$+BN$+SN$+BW$+SN$+BN$+SN$:REM 01010
16820 RETURN
READY.
```



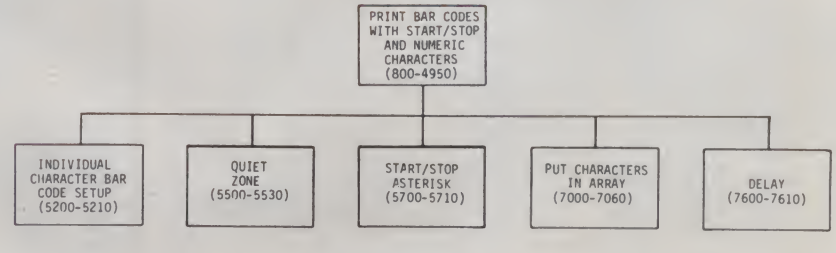


Fig. 1b. Subroutines for flowchart for straight 2-of-5 bar code generator.

Listing 2. Bar code generator program for the KayPro.

```
1 '     STRAIGHT 2 OF 5 BAR CODE GENERATOR KAYPRO 2
2 '        J VERZINO BOX 265 DEWITT,NY 13214
3 '       USES A C-ITOH 8510 PARALLEL PRINTER
4 '          HEIGHT SET BY NV IN LINE 10230
5 '         TO DARKEN BAR CODES, INCREASE NP IN 10235
8 '
9 '    S   MEANS SINGLE ENTRY. CODE IS ENTERED RIGHT AFTER DATA INPUT.
10 '
11 '   A  MEANS ARRAY ENTRY. A SET OF NUMBERS ARE ENTERED BEFORE PRINTING STARTS
12 '
13 '   N   MEANS INDEXED ENTRY.  FIRST,LAST,INCREMENT ARE ENTERED
14 '       THE @ SIGN IS USED TO INDICATE END OF ENTRY
30 '   SWITCH SETTINGS FOR PARALLEL C-ITOH 8510 PRINTER
31 '         SW1 2 CLOSED
32 '         SW2 6 CLOSED
44 '
45 '  #     BINARY CODE
50 '  0     0 0 1 1 0
51 '  1     1 0 0 0 1
52 '  2     0 1 0 0 1
53 '  3     1 1 0 0 0
54 '  4     0 0 1 0 1
55 '  5     1 0 1 0 0
56 '  6     0 1 1 0 0
57 '  7     0 0 0 1 1
58 '  8     1 0 0 1 0
59 '  9     0 1 1 0 0
60 '  WTS   1 2 4 7 P
77  WIDTH LPRINT 255
98 DIM N$(100)
99 DIM NQ$(100),NC$(100)
100 REM ************************************************************
130 GOSUB 10200          'INITIALIZATION
200 PRINT
202 PRINT:PRINT
205 PRINT"WHAT ENTRY METHOD?  (ENTER S,A, OR N)    ":PRINT:PRINT
210 PRINT"(S) ---- SINGLE ENTRY":PRINT:PRINT
220 PRINT"(A) ---- ARRAY OF NUMERIC CHARACTERS":PRINT:PRINT
230 PRINT"(N) ---- SERIES OF NUMBERS":PRINT:PRINT
240 INPUT"   *******  ENTER S, A, OR N **********";Q$
250           IF Q$="S" THEN 290
260           IF Q$="A" THEN 400
270           IF Q$="N" THEN 500
275           IF Q$="" THEN 240
280 GOTO 200
285 REM ************************************************
290 '           SINGLE ENTRY METHOD      ************************
291 INPUT "ENTER NUMBER ";N$
292 IF N$="@" THEN STOP
293 GOSUB 7020
295 GOSUB 800
300 GOSUB 290
350 REM ************************************************
399 '           ARRAY OF NUMERIC CHARACTERS  ******************
400 PRINT" ENTER EACH NUMBER FOLLOWED BY RETURN. TYPE @ WHEN DONE"
405 I=1
410 INPUT NQ$(I)
425 IF NQ$(I)="@" THEN 430
427 I=I+1:GOTO 410
430 FOR K1 = 1 TO I-1
440 N$=NQ$(K1)
445 PRINT K1,N$
450 GOSUB 7020
460 GOSUB 800
470 NEXT K1
475 GOSUB 7600
490 STOP
495 REM ************************************************
499 '           SERIES OF NUMBERS ****************************
500 PRINT"ENTER FIRST #, LAST #, INCREMENT"
505 INPUT NF,NL,DN
508 FOR K2=NF TO NL STEP DN
510 N$=STR$(K2)
512 L=LEN(N$)
514 N$=RIGHT$(N$,L-1)
520 GOSUB 7020
530 GOSUB 800
540 PRINT K2,N$
550 NEXT K2
555 GOSUB 7600
570 STOP
800 REM
820 REM  LINES 900-990 LOAD PRINT ARRAY PP$
900 FOR K=1 TO NL
905 :     :FOR I=0 TO 9
920 :          :IF NC$(K)=M$(I) THEN PP$(K)=P$(I):GOTO 990
940 :     :NEXT I
990 NEXT K
1500 FOR I=1 TO NV
1550      FOR J=1 TO NP
1600 REM:     :GOSUB 7600
2050 REM LINES 2500-3000 PRINTS A SINGLE LINE OF BARCODE
2500 :    :GOSUB 5500
2550 :    :GOSUB 5700
2600 :         :FOR K=1 TO NL
2611 :         :GOSUB 5200
2621 :         :LPRINT PP$(K);
2630 :         :NEXT K
2950 :   :GOSUB 5750
3000 :   :GOSUB 5500
```

More →

overprinting to darken copy. Line 2500 prints a quiet zone, which is 20 vertical lines.

Line 5504 transmits ESC,S,0020, which tells the printer that bit image graphics are coming in the next 20 vertical lines. Lines 5508 to 5520 send 20 successive spaces to the printer. Note the semicolon after the S$ in line 5510. The semicolon tells the printer to "step to the next print position and wait until I tell you what to print."

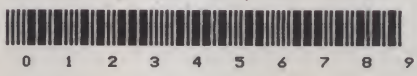
Thus, at line 5530 upon returning, the printhead sits on the 21st vertical line position awaiting instructions on what to print.

Now, back up to line 2550, where we jump to 5700 to print a start code. Line 5702 sends ESC,S,0008 to set up eight positions of bit image graphics. Line 5704 sends the concatenated start code— narrow bar, narrow space, narrow bar, narrow space. The printhead now sits at the 29th position, awaiting the first characters' bar code.

Now back to line 2600, where, from 2600 to 2630, a DO loop prints the NL bar codes of the NL characters in N$. Line 2950 prints the stop code, and line 3000 puts a quiet zone on the right side. Lines 4030 to 4940 print the numbers below the bar code.■

Listing 2 continued.

```
3900 :  :LPRINT CHR$(13);:NEXT J
3950 LPRINT CHR$(13) CHR$(10);
4000 NEXT I
4020 REM
4030 REM 4100-4900 PRINT ALPHANUMERICS BELOW CODE
4200 REM GOSUB 7600
4800 LPRINT
4801 LPRINT" ";
4802 FOR K=1 TO NL
4804 LPRINT "   "NC$(K);
4806 NEXT K
4808 LPRINT"    ";
4810 LPRINT CHR$(13)CHR$(10)
4900 GOSUB 7600
4940 LPRINT CHR$(10)CHR$(10)CHR$(10)CHR$(10)
4945 LPRINT CHR$(10)CHR$(10)CHR$(10)
4950 RETURN
5200 REM
5202 LPRINT CHR$(27)CHR$(83)CHR$(48)CHR$(48)CHR$(50)CHR$(56);
5210 RETURN
5500 REM QUIET
5504 LPRINT CHR$(27)CHR$(83)CHR$(48)CHR$(48)CHR$(50)CHR$(48);
5508 FOR K=1 TO 20
5510 LPRINT S$;
5520 NEXT K
5530 RETURN
5700 REM
5702 LPRINT CHR$(27)CHR$(83)CHR$(48)CHR$(48)CHR$(48)CHR$(56);
5704 LPRINT BN$+SN$+BN$+SN$;
5710 RETURN
5750 REM
5752 LPRINT CHR$(27)CHR$(83)CHR$(48)CHR$(48)CHR$(49)CHR$(50);
5754 LPRINT BW$+SN$+BN$+SN$;
5760 RETURN
7000 REM GET NUMBER TO CODE
7020 NL=LEN(N$)
7030 FOR I=1 TO NL
7040 NC$(I)=MID$(N$,I,1)
7045 IF(NC$(I)<"0") OR (NC$(I)>"9") THEN PRINT"ERROR":PRINT:GOSUB 7600:GOTO 200
7050 NEXT I
7060 RETURN
7600 FOR Z=1 TO 2000:NEXT Z
7610 RETURN
10095 REM
10200 REM INITIALIZE
10230 NW=3
10235 NP=1
10240 B$=CHR$(255):S$=CHR$(0)
10400 LPRINT CHR$(13)CHR$(10)CHR$(27)CHR$(33);
10600 LPRINT CHR$(27)CHR$(84)CHR$(49)CHR$(54);
10760 BN$=B$+B$
10770 BW$=BN$+BN$+BN$
10780 SN$=S$+S$
16200 M$(0)="0":P$(0)=BN$+SN$+BN$+SN$+BW$+SN$+BW$+SN$+BN$+SN$
16210 M$(1)="1":P$(1)=BW$+SN$+BN$+SN$+BN$+SN$+BN$+SN$+BW$+SN$
16220 M$(2)="2":P$(2)=BN$+SN$+BW$+SN$+BN$+SN$+BN$+SN$+BW$+SN$
16230 M$(3)="3":P$(3)=BW$+SN$+BW$+SN$+BN$+SN$+BN$+SN$+BN$+SN$
16240 M$(4)="4":P$(4)=BN$+SN$+BN$+SN$+BW$+SN$+BN$+SN$+BW$+SN$
16250 M$(5)="5":P$(5)=BW$+SN$+BN$+SN$+BW$+SN$+BN$+SN$+BN$+SN$
16260 M$(6)="6":P$(6)=BN$+SN$+BW$+SN$+BW$+SN$+BN$+SN$+BN$+SN$
16270 M$(7)="7":P$(7)=BN$+SN$+BN$+SN$+BN$+SN$+BW$+SN$+BW$+SN$
16280 M$(8)="8":P$(8)=BW$+SN$+BN$+SN$+BN$+SN$+BW$+SN$+BN$+SN$
16290 M$(9)="9":P$(9)=BN$+SN$+BW$+SN$+BN$+SN$+BW$+SN$+BN$+SN$
16820 RETURN
```



0 1 2 3 4 5 6 7 8 9

TS-1000 Road Maps For the Weary Traveler

These handy subroutines put you behind the wheel of your micro machine.

By W.R. Henry

Listing 1. Snake Game for the TS-1000.

```
5 CLS
10 PRINT"PLACE YOUR BETS ON THE SNAKE."
12 PRINT"NUMBERS 1 THRU 15"
20 PAUSE 200
30 CLS
40 LET N =INT(RND*60+1)
50 FOR A=Ø TO N STEP .2
55 SCROLL
60 LET Y= COS(2*A) +SIN(A)
70 PRINT TAB(7*Y+14);"*;*"
80 NEXT A
90 LET B = INT(RND*15+1)
100 PRINT AT 21,Ø;"SNAKE STOPS AT ";B;"  ";B;"WINS"
110 PAUSE 200
120 CLS
130 GOTO 1Ø
140 REM" Line 40 sets random point on screen
        To print leading edge of snake."
150 REM" Line 50 sets sequence of positioning
        snake from right to left in increments."
160 REM" Line 55 Scrolls display for illusion
        of movement of snake."
170 REM" Line 60-The formula for a sine wave
        using a vertical axis to keep snake
        printed within screen display limits."
180 REM" Line 70-Prints characters along path
        of stored sine wave pattern."
190 REM" Line 80-Closes the FOR/NEXT loop to
```

More →

The increasing hordes of new Timex-Sinclair 1000 computer users are not primarily interested in programming. Like the new car owner, they just want to "get in and drive." But it isn't that simple, for there still exists a dearth of software and a lack of easily understandable instructions on getting this simple but versatile machine up and working.

Manuals accompany the computer and are excellent as far as they go. But, although they are good for referencing when you are stuck with a particular problem, they just don't give enough specific examples to make the new user comfortable.

Driving Practice

The following subroutines are designed to help you, the new owner of a TS-1000, feel at ease in the driver's seat.

Since many users will be faced with the inevitable question, "Daddy, can it play games?", here's a simple betting game based on the selection of a random number, with graphics to grab the youngster. (See Listing 1—Snake Game.) The Remarks statements are included to explain what each statement causes the computer to do. (One of my neighbor's children was so fascinated by the snake wriggling down the screen that he watched quietly for an hour.)

Address correspondence to W.R. Henry, 335 Lakeshore Drive, Daytona Beach, FL 32014.

Listing 1 continued.

```
        repeat the process in the loop."
200 REM" Line 90-The random sequence that
        determines winning number."
210 REM" Line 100-Prints winning number
220 REM" Line 130-Causes computer to rerun
        the program for next game."
230 REM" HIT THE BREAK KEY OR PULL PLUG TO
        STOP THE GAME."
```

```
5 PRINT"TELEPHONE NUMBERS"
10 INPUT N$      'Input 1st data line
20 PRINT N$      'Print the input
30 IF N$="JONES" THEN PRINT"904-322=1517"
                 'Match Name to Phone #
40 IF N$="SMITH" THEN PRINT"904-761-1818"
                 'Match Name to Phone #"
50 IF N$="NAME 3" THEN PRINT "PHONE #3"
60 IF N$="NAME 4" THEN PRINT "PHONE #4"
70 REM "The above can be continued as
      required for all names needed."
```

Listing 2. Data bank program from Byting Deeper in Your Sinclair Timex *(John Wiley & Sons, Inc.), by Mark Harrison.*

```
5 FOR P=1 TO 70
10 FOR A = 1 TO 1Ø
20 PRINT CHR$(A);
30 NEXT A
40 NEXT P
50 CLS
60 LET J = INT(1+RND*5)
70 FOR N = 1 TO  335
80 FOR A = J TO 138 STEP 128
90 PRINT CHR$(A);
100 NEXT A
120 NEXT N
130 CLS
140 GOTO 5
150 REM"Note that when RUN, the first
       pattern repeats,the patterns
       change from then on. Look at
       Line 60 to see why."
```

Listing 3. Simple graphics output program for the TS-1000.

Next, let's try a practical use—a simple data bank (see Listing 2) for display of often needed information. A sophisticated database management program it is not. However, it is practical and adaptable for many uses—birthdays, anniversaries, appointments or whatever. (The program in Listing 2 is from the book *Byteing Deeper Into Your Sinclair Timex 1000*, by Mark Harrison. Used by permission of John Wiley & Sons, Inc.)

Now, just for fun, let's explore one function of the Sinclair. This will prove to you how a relatively simple program can generate a lot of output or display on the TV screen. Let's choose the Random Number Function (RND), hook it up to a few graphics characters and see what happens. (See Listing 3.)

All you have done here is instruct the computer to make a random selection of graphics characters, display them, reprint them a specified number of times, clear the display and then repeat the whole process again. When you analyze the program line by line, you can see how simple it is. Try it; you'll like it!

As long as you've gotten your feet wet with graphics, why not try another short routine to print lines on the screen? (See Listing 4.) Here, we have the computer print the first line; then we plug this command into a repeating loop, and the Sinclair does the rest.

Down Memory Lane

For those of you who are technically minded, it's always confidence-building to know how your machine operates. I won't give you a technical description of the architecture of the Sinclair chips, the integrated circuits used or how the chips perform their magic. We'll leave that to the technical writers. I'm going to talk about memory storage, or the Sinclair "stack."

Hopefully, after reading and trying what follows, you will become as familiar with this stack as you are with your own clothes closet. Thus, you will be able to pick any "suit" out of it that you need to fit the occasion.

With Fig. 1 for reference, enter the program in Listing 5 into the computer and run it. Notice anything interesting? Sure you do. Now you know where in the stack, or memory, the computer stores your programs.

The computer displays the address of each element or byte of each program line by showing the contents of each item stored at each address. Notice that it starts and ends at a specified address. That is how the stack keeps its cool. It has a place for every bit of information, it stores it there and keeps everything neat and orderly for instant access.

Everything a computer does, it does by the numbers. At each address in memory (except unused or unfilled memory cells), there resides a number. This number is a code that designates a letter, a number, a graphics

	Address	Contents	
Don't Poke this area	0000	8K Basic Interpreter and Monitor	ROM (Read Only Memory)
	8192	Unused	
	16384	User Memory	
Can be Poked and Peeked	17408 32767	Expansion Area	RAM (Random Access Memory) Your programs are entered in this area.

Fig. 1. The ZX-81 "stack," or memory.

Listing 4. TS-1000 line-printing routine.

```
5 REM "Program prints various types of lines."
8 CLS
```

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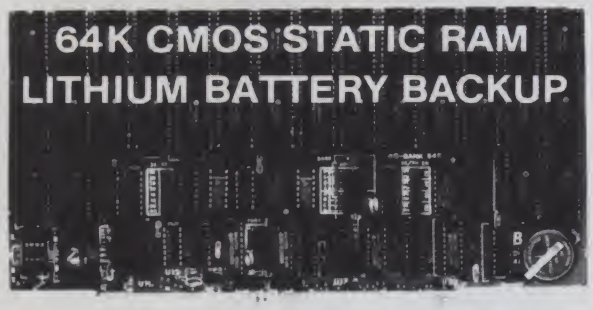

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Listing 4 continued.

```
10 FOR P=1 TO 31  'Sets how many characters
20 PRINT CHR$(27);'Selects Character to print
30 NEXT P         ' Closes loop-Do it again
40 FOR N =1 TO 31
50 PRINT CHR$(22);
60 NEXT N
70 FOR P=1 TO 31
80 PRINT CHR$(131);
90 NEXT P
100 REM"Above does 3 separate loops. Next
comes the use of 2 nested loops."
110 FOR P=1 TO 31
120 PRINT CHR$(22);
130 FOR N=1 TO 31
140 PRINT CHR$(131);
150 NEXT N
160 NEXT P
170 REM" When RUN-Note difference in sequence
in lines when printed in 2nd section which
has the nested loops P & N."
```

```
5 CLS
6 REM"This routine finds Memory Addresses
      where your Program is stored"
10 PRINT"PROGRAM ADDRESS"; TAB 10;
   "CONTENTS";TAB 20;"CHARACTER"
20 FOR P = 16509 TO 16653
30 PRINT P;TAB 10;PEEK P
40 LET N = PEEK P
50 PRINT P; TAB 10;PEEK P;
60 PRINT TAB 20;CHR$(N)
70 NEXT P
80 REM"Line 10 Prints tabular heading"
90 REM"Line 20-Memory Addresses to be displayed"
100REM"Line 30-P is first address to display.
       Letter N stands for contents of address."
110REM"Line 50-The key-Tells us just how our
       program is stored."
120REM"Line 60-Likewise-But in English so we
       can understand it without decoding CHR$"
130REM"Remainder of program is a repeat-each
       Line displays a sequential output of
       each program statement,its code & the
       actual character represented."
```

Listing 5. Program showing where TS-1000 stores data.

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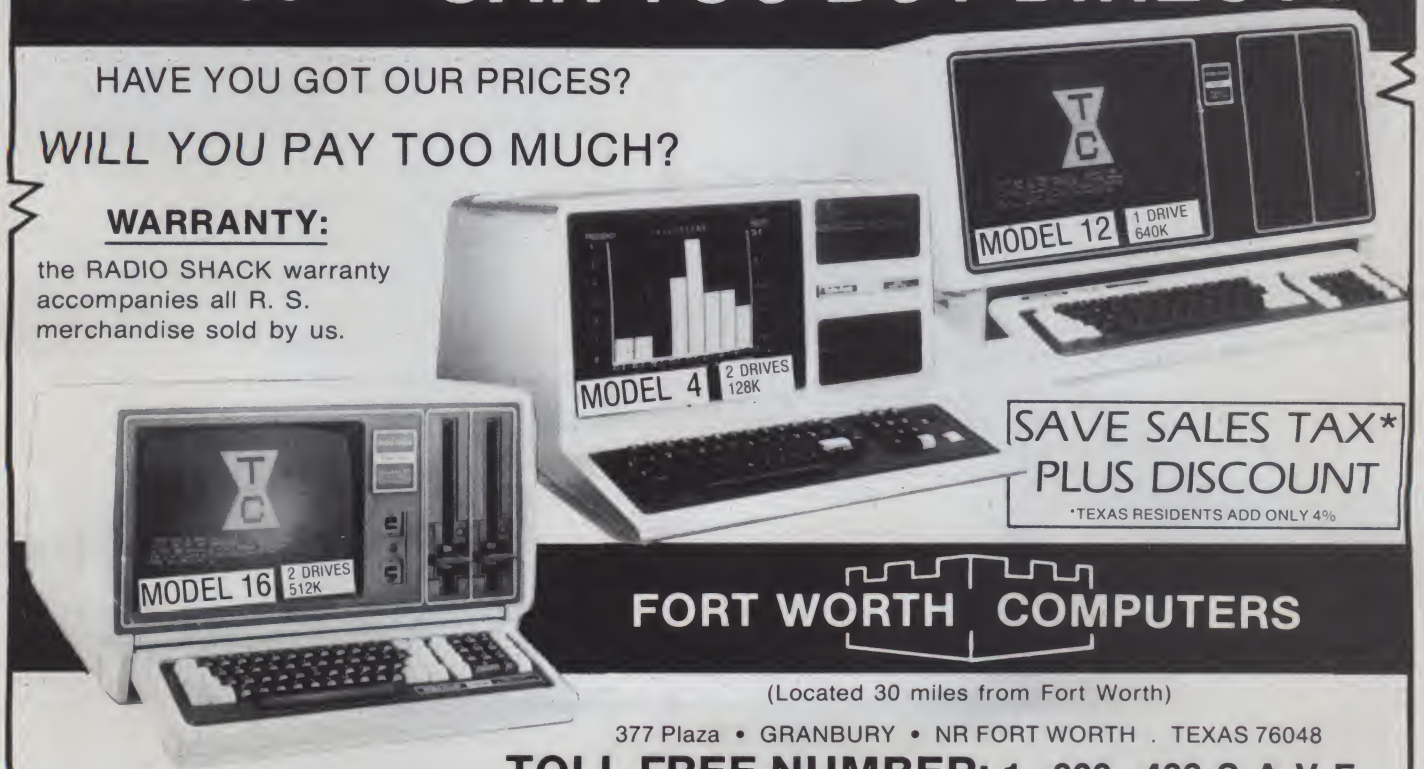

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symbol or some other function that the computer can recall and use in performing the tasks assigned to it by the program statements.

If you will examine the Remarks statements line by line in Listing 5, you will readily understand how it does this operation. It does it using the binary number system, which is a can of worms we won't open right now.

Peek and Poke with Care

When I got my Sinclair ZX-81 two years ago, I was awed and frightened by the warnings contained in the instruction manual regarding Peek and Poke functions. I had visions of the computer going up in smoke if I made the slightest error. Sure, you can mess up the computer if you are really careless. The simple solution, which set my fears at rest, was to tape a typewritten card above the computer keyboard, saying:

Do NOT Poke: Addresses 0000 to 8191 inclusive or 16384 to 16508 inclusive
You CAN Poke: Addresses 17408 to 32767 inclusive

Notice in Fig. 1 that all the forbidden addresses contain the System Variables—namely, the command instructions that are part of the "brain" of the computer. Poking into these areas is comparable to disarranging the spark plug timing on your car. The car will still be there; it just won't run.

In any program containing a Poke instruction, the first and last things to check before running the program are the addresses being Poked, to make certain you are not entering a forbidden area of memory. Certain of these areas may be Peeked, however. Consult your instruction manual.

Foreign Accents

What about all those fine programs written for other computers that you've noticed in the magazines? Wouldn't it be great to run them on the Sinclair? You can, if you have the time and patience to convert them to Sinclair language. After all, most of them are written in Basic, aren't they? The problem is that they are in different "dialects" of Basic.

Just as a Southerner and a Yankee sometimes have difficulty communicating with each other, some computers cannot understand and use a program written specifically for another machine. Same language—different dialect. But all is not lost.

Simply determine which commands or statements are incompatible with the Sinclair computer, then rewrite these program lines using statements the Sinclair understands. This requires some work, but is not too difficult.

If you are converting a long TRS-80 program with numerous print indexed references, it will pay you in time saved to use the subroutine in Listing 6 and let the computer do the math for you.

Space does not permit a complete listing of all subroutines used in TRS-80-to-Sinclair conversions. If you wish, send me your name and address and a buck to cover my paper, printing and postage costs, and I will send you complete listings of all the conversion subroutines I regularly use.

Finally, to end up with another goody, the program in Listing 7 is handy for centering titles, menus, or whatever else you wish to put on the screen. It saves counting the letters in each title. The computer does it for you with this program.

Hopefully, these few pointers will illustrate some of the many capabilities of the Sinclair computer. While it may look like a toy, the Sinclair is capable of some fine programming, leading to many enjoyable and useful hours. Just tell it what to do in its own Southern dialect.■

```
5 REM"This routine converts TRS-80 PRINT @
      statements to the equivalent ZX81
      PRINT AT (Line),(Column) Statements"
10 CLS
20 PRINT TAB 10;"CONVERTING PRINT INDEX"
30 LET C$="COLUMN INDEX"
40 LET L$="LINE NUMBER"
41 LET L=Ø
42 LET C=Ø
45 INPUT T
50 IF T>=64 OR T<=127 THEN LET L = 1
55 IF T<=63 THEN LET C=INT(T*.49206)
60 IF T<=127THEN LET C=INT(T-63)*.49206
65 IF T> 127 OR T <=191 THEN LET L=2
70 IF T> 127 OR T <=191 THEN LET C=INT(T-127)*.49206
80 PRINT "LINE NO.=";1;"COLUMN NO.=";INT(C)
90 GOTO 30
100 REM" The process can be repeated for each
        conversion provided if the TRS-80 PRINT @
number is higher, the value of T is decreased by
an appropriate increment of 63 for each line and
the value of L is increased by 1 each time."
```

Listing 6. Subroutine for converting TRS-80 programs with print indexed references.

Listing 7. Program for centering titles, menus or other input data.

```
5 CLS
10 REM "When prompt (L) appears-Type in
        Your Title Text"
20 REM "Use other values for A B & C to
        Relocate Your Title"
```

More →

Listing 7 continued.

```
30 INPUT A$          'Input for Text of
                      TITLE
40 LET A=1Ø          'Indicates Line # to
                     place title on
50 LET K=14-LEN(A$)/2
                     'Measure title length
                      for centering
60 PRINT AT A,K;A$   "Print title @Line A
                       Column K
70 INPUT B$          'Input for 2nd Title
80 LET B=11          'Position-2nd Title
90 LET K=14-LEN(B$)/2
                     'Sets start 2nd Title
100 PRINT AT B,K;B$
                     'Prints 2nd Title
110 INPUT C$         "Repeat of Title for
                     3rd Title Input
120 LET C=12         'Same as A & B
130 LET K=LEN(C$)/2 'Same as for A&B
140 PRINT AT C,K;C$ 'Print 3rd Title
150 REM     "The  ' Symbol Indicates a
             REMARK
```

Something to Write About

No more typing on the keyboard with the Personal Penpad for the IBM PC. Simply write your data on a graphics tablet, and the micro will discern what you wrote.

By Kenniston Lord

Fear of the computer keyboard, called "terminal phobia" by *Time* magazine, is a serious impediment to many people, from executives to clerks and factory workers. A new product, The Personal Penpad, removes any need to be embarrassed about your typing ability by substituting for keyboard entry a skill — writing by hand—in which everyone has considerable training.

Its manufacturer, Pencept, Inc. (39 Green St., Waltham MA 02154), has devised a means whereby you can enter data and commands into a computer (not only a microcomputer but also larger systems) merely by handwriting. All that you need to communicate with the computer is paper, pen, and the Personal Penpad digitizing tablet. I tested the IBM PC version for this review.

The input process has been simplified to the point where block printing of the English alphabet and the Arabic numerals is the only skill required to use the Personal Penpad. The system has great flexibility. Fig. 1 shows a set of sample characters that the Personal Penpad can read. If your writing ability is at least this good, you can provide error-free input to the computer.

The Personal Penpad's controller is the size of a large book and is designed to be sandwiched between the computer's system unit and the monitor.

The Writing Tablet

You write on a 15½-inch square graphics tablet upon which paper has been mounted. This tablet is divided into two sections—a forms area (where the data itself is entered) and a command area (where you enter commands specific to the software or to the hardware used). Fig. 2 illustrates the tablet layout.

The paper used is 8½ × 11 inches, with a printed grid that coincides with the electronic grid mounted in the graphics tablet. Forms may be locally produced or obtained from Pencept, and other sizes of graphics tablets and forms are available. Tablet form grids may be defined and software commands identified to the computer.

To use the Personal Penpad, you place a form on the tablet surface and calibrate it by a set-up procedure. From that point, all that is necessary is to write on it with a standard ball point pen cartridge fitted to a stylus and attached to the Penpad's controller.

Block capitals A to Z, Arabic numerals 0 to 9 and 15 other characters will be accepted. Once written on the form, a character is interpreted by the controller, which, using matching algorithms, compares what has been entered to the permissible characters.

Assuming that the written character meets the algorithm's conditions, immediate visual verification is possible—the character appears on the microcomputer's screen. If the character does not meet the algorithm and cannot be interpreted, a question mark

Address correspondence to Kenniston W. Lord, Jr., 45 School St., Winchendon, MA 01475.

will appear in its place on the monitor. Rewriting the character will usually correct the problem.

Data editing becomes a part of the entry process. The computer holds the permissible codes for a given location on the grid, and if some other code is entered, reacts accordingly. You can define the grid boxes to accept data, reject data, move a loaded string or accept only certain valid characters. The data captured is ACSII data, which may be processed by any program established to read an ASCII file, such as a word processor.

The Controller

The controller is about the size of a large book 3 × 14 × 11 inches laid on its side, and is designed to be placed in the space between the PC's system unit and its monitor, as shown in the photograph. Interface to the PC is via the serial asynchronous board, using EIA RS-232C. (This interface is not a standard item and must be purchased separately for approximately $150.)

Memory used for the Personal Penpad is part of the controller interface itself; therefore the memory required of the PC itself is only the amount necessary to operate the software that uses Penpad data as input. The speed of the input, which is serial, may be varied.

There are three modes of input:

- Character coordinate mode: As each character is hand-printed, it is transmitted by Dynamic Character Recognition (DCR) to the PC, with its tablet row and column position. This mode allows the software to take maximum advantage of the input. It logically aligns boxes on the paper forms to memory boxes located in arrays in memory.
- Keyboard compatible mode: As each character is hand-printed, it is transmitted by DCR to the PC as the *next* character, devoid of position information. If an error has been made on a character, it need only be rewritten. The controller provides the appropriate backspacing and correction, just as if you had moved the cursor and keyed in a correction.
- Graphics input mode: The graphics tablet is, after all, a graphics tablet, and for years they have been used as digitizers. Personal Penpad provides the same facility, allowing applications which combine both text and graphics.

Dynamic Character Recognition

DCR is the state of the art in pattern recognition, according to Pencept. The process is not simply to recognize a pattern that has been placed within known boundaries, as has traditionally been the case. DCR electronically simulates the hand movements which

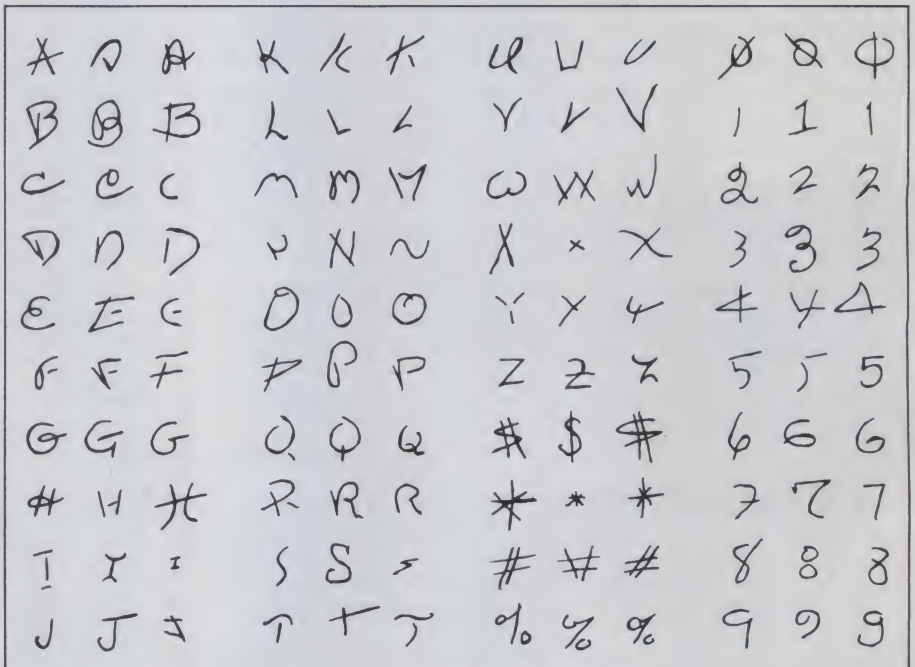

Fig. 1. A sample of characters that the Personal Penpad can read.

are used for character formation and hence is not constrained by the specific size of the character.

Pattern recognition alone would require the letter B, for example, to fit within one specific set of location coordinates on the graphics tablet. This is the case for characters written on pre-printed forms in the character coordinate mode. However, I was able to write a six-inch letter B in the keyboard compatible mode, with the result that the letter correctly appeared in the next available position on the entry line.

The key to DCR is the concept of "dynamic." DCR recognizes letters as they are being printed, and it accepts the writing skills of the person doing the printing. Optical Character Recognition (OCR), on the other hand, requires machine-formed or very carefully hand-formed characters, and must pass the printing fully by an electronic "reading" mechanism before recognition can take place. Understandably, OCR has a fairly high loss rate.

The algorithms built into the Personal Penpad are extensive, allowing recognition even of relatively sloppy printing. To provide this level of facility, the capability had to be built into the system to allow for individual, cultural, and academic factors. The human tendency, for example, to form similar characters when writing "2" and "Z" had to be taken into account, as well as the similarity between zero (occasionally slashed) and the letter O and the European (and some programmers') tendency to place a cross-bar on the letter Z and the number 7.

How DCR Works

The act of printing causes a person to move his pen in diverse directions at variable speeds. The pen point is moved back and forth, up and down, lifted from or dropped to the paper. Each of these actions forms the basis of a pen stroke. Combine a pen, a high-resolution graphics tablet and the power of the computer's sampling capability, and the movements of hand and pen can be captured. Extensive pen movement discernment at high speed makes handwriting input both possible and highly reliable.

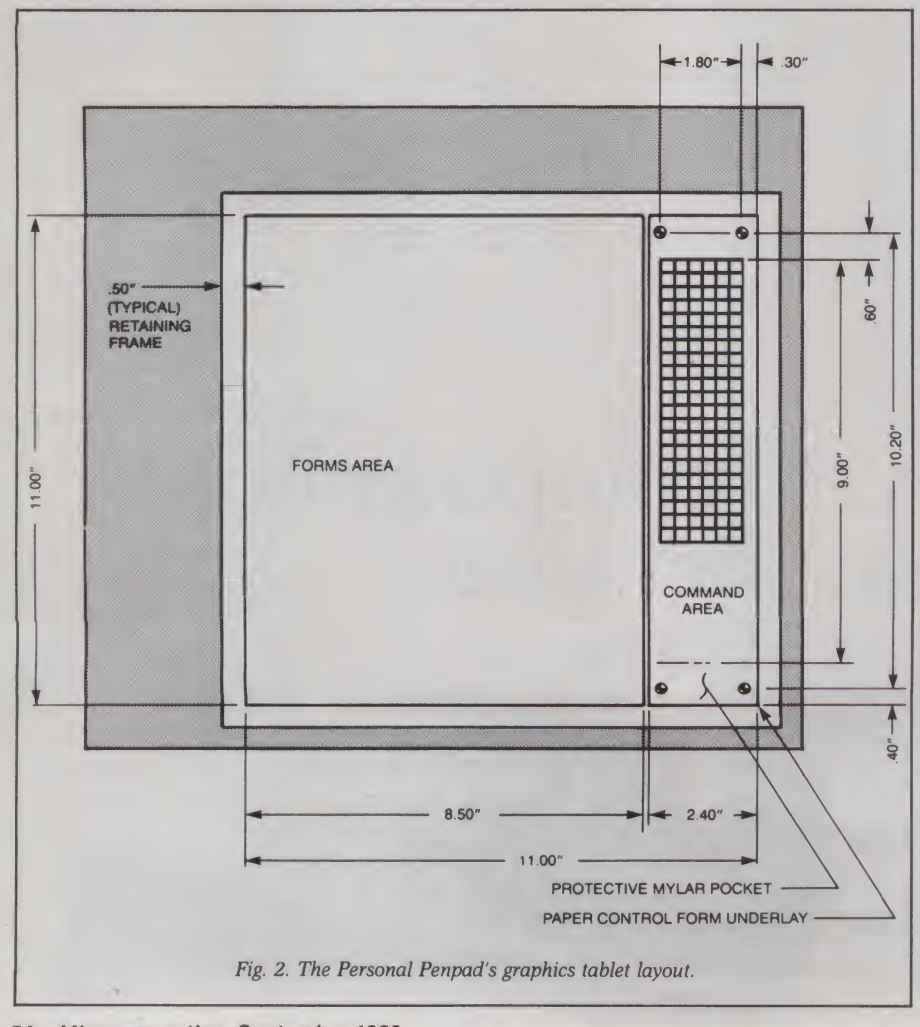

Fig. 2. The Personal Penpad's graphics tablet layout.

A handwritten character is received by the unit as a rough image that is then cleaned up, or "preprocessed." Crooked lines are straightforward, extraneous marks are removed, and the character is shaped to conform to one of the images contained in the controller's algorithms. In the character coordinate mode, and in some instances in the keyboard compatible mode, the character is written in a precise place on the paper. This location is a specific size, and since the bulk of the character is formed at that location, shaping of the character is generally confined.

Space is a secondary limitation. The handstrokes which are used to form the letter F are precisely the same as those used when forming the two characters 1 and =. This presents some difficulty in the keyboard compatible mode, as the entered character shows up as two characters. Since they would be printed in two adjacent boxes in the character coordinate mode, that problem would not exist.

Generative rules and perceptual rules have been incorporated into the DCR process. Generative rules cover those movements used to form the character. The movement is sensed by the penpoint, detected by the stylus, and transmitted to the controller. All the logically possible ways to form a handwritten letter have been built into the unit. Those methods are then compared to the letter formation used when the character is written.

While the rules are extensive, there will be ways to defeat them if it is desired to do so. By and large, there is a finite number of ways to form the letters, and those ways have been included. The perceptual rules compare the shapes entered with those identified within the system.

Pencept holds that these methods provide nearly instantaneous recognition and advises that if the writer prints letters that are so sloppy another person would have difficulty recognizing them, the computer cannot be expected to do much better.

Hand-printing recognition technology is relatively new and has found its first successful implementation in this Pencept product. It can be seen that fear of the keyboard may easily be removed through this method.

The training required to use the Personal Penpad was really done years ago when the writing process was learned. All you now need to do is learn to use the Personal Penpad, turn on the computer, load a disk, load a form, pick up the pen and print.■

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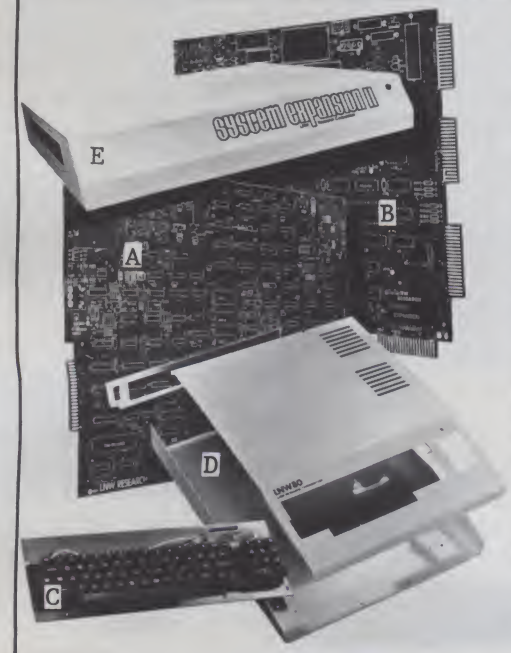

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Stick It for $10

In this article, the author explains how to make your own joystick for only $10.

By H. Bruce Land III

If you think joysticks are just for games, think again. They are a serious programming and data aid.

An Apple, for example, is already wired for joysticks; you only need to plug them in. Other computers accept them almost as readily.

A good joystick costs between $50 and $100; some discounts are available, but why spend so much? Why not just build your own?

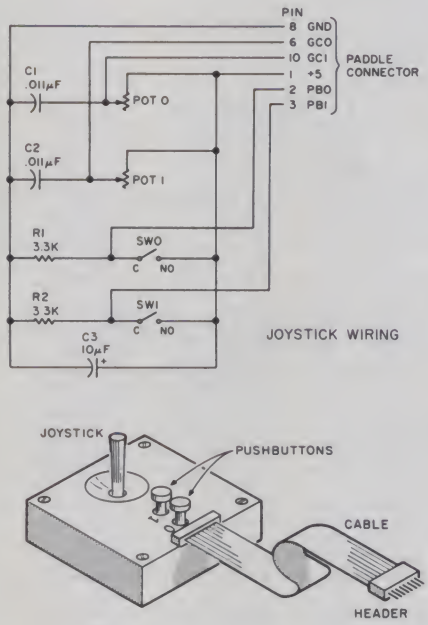

Fig. 1. Connecting the joystick. Use about six feet of six conductor cable for each joystick. Make a hole in the box for one end of the cable. The other end goes to the DIP header.

Why Should You?

There are three good reasons why you should:

- You'll learn something about your computer.
- You'll enjoy creating hardware (known as physical therapy by some people and mental therapy by others).
- Your wife won't let you shell out another $50 on "that dumb computer."

How Do Joysticks Work?

When the joystick moves along one axis—say from north to south—it mechanically adjusts the potentiometers. These changes appear in the computer as digital values from 0 to 255.

When the joystick moves from east to west, it generates similar values at a different location. If it moves on one of the 45 degree diagonals, it generates equal values in the two locations.

The two switches will perform a variety of functions. You can use them to cause data to be read or written, movement to start or stop, guns to shoot, subroutines to be called and so on.

You could probably make a set of joysticks with parts from your junk box, but if you buy a few items (from a nearby Radio Shack or another electronics supply house) you can build good ones that will cost no more than $10 each, even if you buy nearly all the parts.

Unless you're a good engineer, you won't want to try to build the stick itself; it's mounted on gimbals to swing freely in any direction, changing the settings of the two pots as it moves. Your junk box will probably have many of the other parts, but if you decide to buy them at a Radio Shack, you can use the parts list shown in Table 1.

First, you need to decide where the two switches and the joystick will be mounted. I mounted mine on the metal plate that forms the top of the mini box. Use any box that fits your hand; a tin can works well. Use the template on the back of the joystick package to mark the positions of the mounting screws.

Using about six feet of six-conductor cable for each joystick, make a hole in the box for one end of the cable. The other end goes to the DIP header. Fig. 1 shows how to connect it. (Radio Shack has a flat cable with a DIP plug already attached to one end. Unfortunately, the only length available is 18 inches and that's a bit too short to use with joysticks.)

The resistors are there just to pull down a gate, so any value from 1000 to 4700 ohms, ¼ watt, should work. C3 is a filter capacitor, so any value from 4.7 μFd up should be all right, as long as the working voltage is 6 V or higher. Incidentally, if any of the switches in your paddles have failed, these are good replacements.

Wire the cable to the switches, joysticks and resistors. They can be wired to stand-off insulators, or directly together.

It Gets Tricky

Now comes the tricky part: the selection of C1 and C2. They must be

Joystick		RS #271-1075	$4.95
Box, 4 × 2.12 × 1.62		RS #270-231	1.69
Pushbutton switches		RS #275-1547	2.49 each
DIP header		RS #276-1980	1.49
Capacitors, .01 μFd	(2)	RS #272-131	.39 each
Resistors, 3.3k	(2)	RS #271-1328	.39 each
Capacitor, 10 μFd		RS #272-1013	.59
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Table 1. Listing of parts necessary to construct your own joystick. These items can be purchased at Radio Shack stores.

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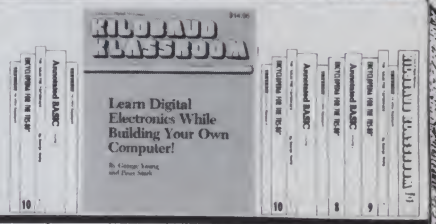
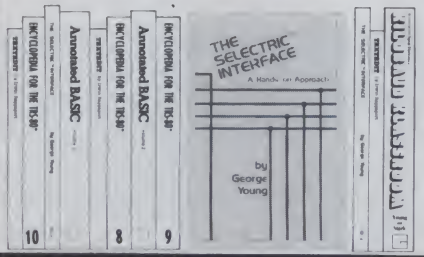


THE SELECTRIC INTERFACE by George Young



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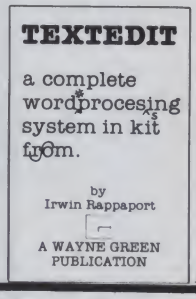

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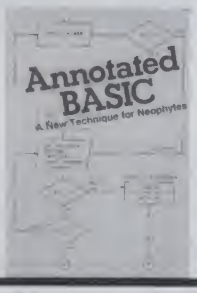

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chosen to give, along with the 100k resistance, a time constant of 0.0033 of a second. To understand why, you need to know what the signals are and how they are used.

When you execute X = PDL(0) or Y = PDL(1), the computer sends a signal to the joystick (or paddle) and starts counting. It will count to 255, unless it is stopped by a signal from the joystick.

The signal sent back to the computer will be delayed by a period of time that is determined by the RC constant of the circuit. Since the value of the capacitor will be constant, the duration of the delay will be determined by the resistance.

Thus, the figure in the counter represents the resistance of the joystick circuit, which represents the position of the joystick. This measurement is passed along by the computer to whatever is being controlled—direction and distance on the CRT, figures, rates or whatever.

In an RC network, the value of the time constant is given by the formula T = RC. The factory setting is 0.022 μFd., giving a time constant of 0.0033 of a second with a 150k-ohm joystick. Apple installed the 0.022 μFd. inside the computer. To get the same time constant with a 100K joystick, we need an additional 0.011 μFd. of capacitance.

Capacitors of 0.01 μFd. are common, and since the manufacturing tolerance for a capacitor may be as much as ±20 percent, your 0.01 capacitors may work. Try them; run the short program to read all the values generated by the joystick, and see if it gives you all of the values from 0 to 255 in each direction. If it doesn't, turn off the computer and replace C1 or C2 with a different capacitor.

You may need to try several before you find a working combination. If you don't find one in a few tries, you can solder a small 0.001 capacitor across the 0.01. (Be sure to disconnect the joystick from the Apple before soldering! It is quite possible for the soldering iron to generate enough static *electricity* or leak enough 110 V ac to blow something within the computer.)

When both axes of the joystick generate the required range of values, you're finished. Tie the cable to the back of one of the switches with string, so that you will not yank the cable out of the box during a heated data entry session, and then screw the cover on the box.

Now, what do you do with a joystick? That's a subject for another article, but to start, you can link it to your cursor with software. Then you can use it for data entry, to select items from a menu, use a computer-aided design program, or lay out a PC board.

A program called TEKSYM simulates a Tektronix graphics display unit. If you tire of this heavy work, remember that Pac-Man (Snoggle), Space Raiders, Defenders and similar programs all use this mode of data entry.

If it's good enough to save the universe from alien invaders, isn't it worth trying?

Test Programs

Joystick Test Program #1 will always work. Some computers require the delay given by Line 20:

```
10 PRINT PDL(0);
20 FOR I = 1 TO 40: NEXT I
30 PRINT "     ";PDL(1)
40 GOTO 10
```

Test Program #2 will usually work:

```
10 PRINT PDL(0), PDL(1)
20 GOTO 10
```

Photo 1 shows the interior of the homemade joystick. For a glimspe of the finished product, see Photo 2.■

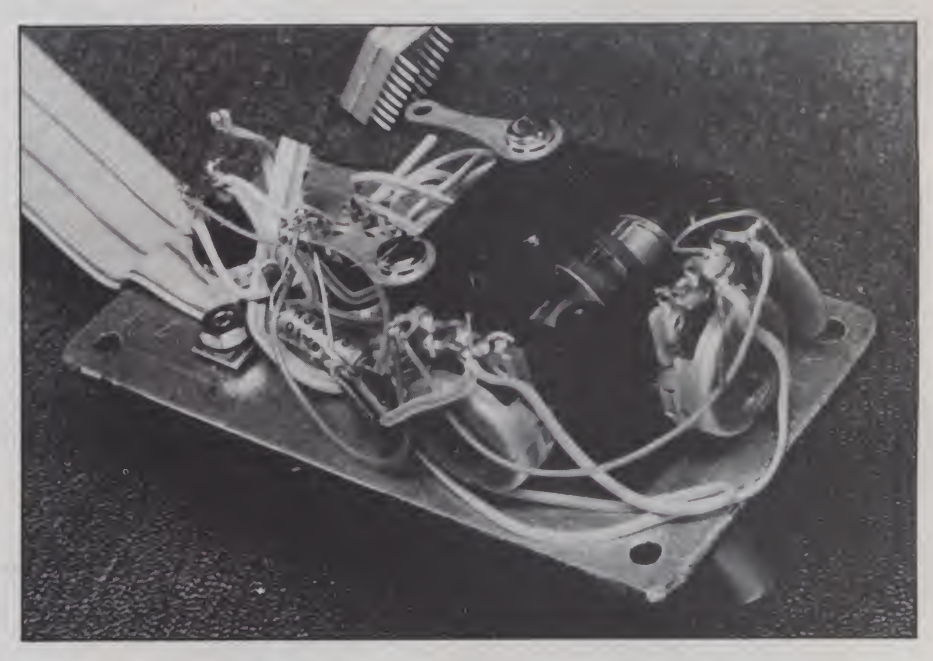

Photo 1.

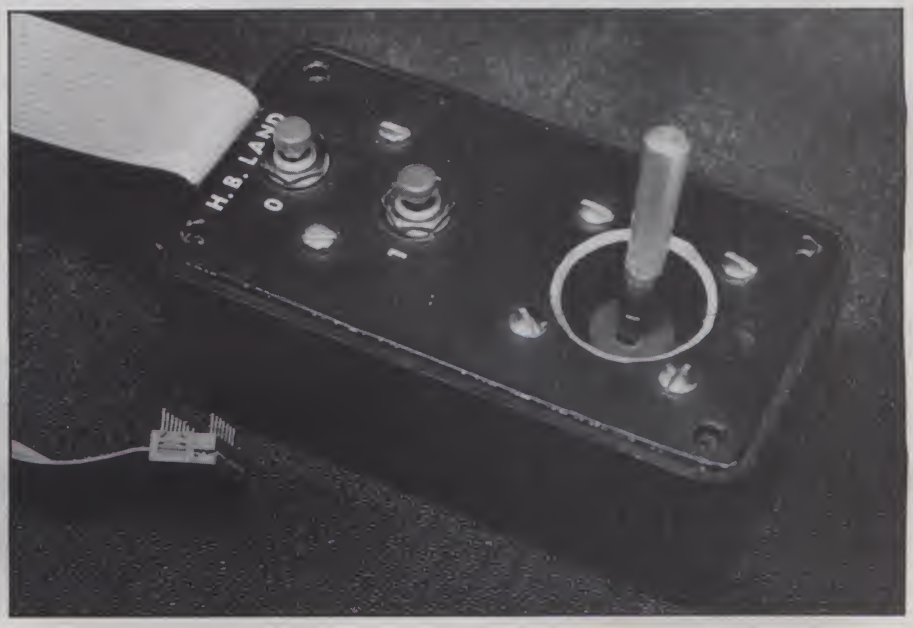

Photo 2.

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Heath's ET-100 Is Outta This World

This 16-bit do-it-yourself micro is worth phoning home about.

By Timothy Daniel

What do color televisions, ham radio rigs, solar hot water heaters and robots have in common? Not much . . . unless you happen to think of the Heath Company.

As America's headquarters for hi-tech kits, this subsidiary of Zenith Corp. has built a reputation for offering a mixed bag of do-it-yourself products. And while the furniture kits and satellite TV receivers never lit the world on fire, the same can't be said for Heath's line of microcomputers. A 1982 survey of sales placed Heath and its partner Zenith Data Systems in sixth place, right up there with Apple, Tandy and Commodore.

The New Member of the Family

The newest member of the Heath/Zenith computing family is the ET-100 Learning Computer. Representing a mixed pedigree, the ET-100 shares the educational approach offered by Heath's ET-3400 eight-bit trainer and the 16-bit technology of the company's recently announced H-100 and H-120 personal computer line. Heritage aside, I carried a head full of questions when I was Heath's guest for a one-day promotional session at their plant in Benton Harbor, MI.

Will the ET-100 Measure Up?

At a cost of $999.95, will the ET-100 measure up to the track record of the ET-3400, a darling of the educational market that has sold more than 100,000 units in its five-year history? And, when expanded, does the ET-100 become enough of a clone to ride on the *IBM Personal Computer*'s coattails?

The answer to these questions, according to Heath, lies in the ET-100's multipurpose appeal. When accompanied by Heath's Advanced Microprocessors Training Course, the ET-100 will attract folks who are just beginning to learn about micros as well as those who need to upgrade their knowledge from eight-bit to 16-bit computing.

Thanks to its breadboard feature, access to data, address and I/O lines, and the ROM-based programming aids, the computer belongs in yet another market niche: engineering design and test systems. Third, and perhaps of most interest to *Microcomputing* readers, is the Learning Computer's role as an inexpensive way to try 16-bit computing.

How It Happened

Perhaps the best way to review the ET-100's features is to trace its development. In making the transition to 16 bits, Heath found that hand-assembled machine language programming taxed sensibilities. The decision to go

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Heath's educational trainer will teach you a thing or two about 16-bit computing.

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—Need to reorganize files? POWER! sorts and formats the directory in 4 different ways. And you can easily copy or move files from user area to user area. **POWER!** creates 32 user areas instead of CP/M's 16.

—Need to change memory? POWER! searches, displays and lets you change memory wherever you want. You can even automatically run software anywhere in memory. And you can inter-mix your search with as many wild card jokers as you need to find, for instance, all occurrences of "Sam Jones" and "Sid James" just by typing "S??J??". And **POWER!** also lets you read or write to any sector or track very simply.

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Ease of Use	☐	☐	☐	☑
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with an assembly language-based system was accompanied by several fundamental design changes from the barebones design of the 68000-based ET-3400.

The expanded character set meant that a full keyboard and improved displays were required. The final result was a design that incorporated all the features of a complete system: alphanumeric keyboard, 80-column composite video output and cassette-based mass storage.

Another equally important series of decisions resulted in the use of the 8088 microprocessor. After coming this far, it was only a matter of common sense to pursue the computer's similarity to the IBM PC by adding the ability to upgrade to a disk-based system with color graphics that can use the growing library of MS-DOS software.

Look at That ROM

In its basic configuration, the ET-100 has 32K of ROM, 16K of RAM, RS-232 port, composite video output, breadboard with buffered I/O, detachable keyboard and a power supply.

The kit version of the Learning Computer takes 12 to 14 hours to build, with most of the work related to the construction of the power supply and cable harnesses.

The main CPU board comes preassembled, but it can be expanded to 64K of RAM. Factory assembled, the computer costs $500 more, $1499.95. To use the computer, all you need to add is a cassette recorder and video monitor. In a pinch, you could use a modulator-driven TV set by switching the video display to 40 columns.

Upgrading to a disk-based system takes about 16 hours and requires the ETA-100, which costs $1299.95 ($1999.95 for a factory-assembled version). The upgraded package includes 128K of RAM, 320K floppy disk drive and controller, two RS-232 ports, programmable timers, bit-mapped video board (640 × 255 resolution), and a parallel printer port. A dust cover for the breadboard is included in the upgrade, making the finished computer a handy resting place for a video monitor.

At this point, you'll have a system capable of running many Z-DOS programs. (Z-DOS is Heath's name for MS-DOS, a product of Microsoft, Inc., that is fast becoming the standard for single-user 16-bit microcomputers, including the IBM PC.)

A second level of upgrades is available when you add another 64K of RAM, another drive in the existing enclosure and two RAM chips to give eight-color video. To enjoy the improved display, you'll need an RGB monitor.

If you decide to use the ET-100 as a learning tool, you'll need to invest $99.95 in the EE-8088 Advanced Microprocessors Training Course. This includes a comprehensive textbook and pack of parts that are used in the course's many experiments.

Putting It Together Is Easy

If the ET-100 is your first Heath kit, you may be surprised by the fact that the actual assembly of the unit is not much of a learning exercise. Thanks to the explicit directions, anyone can build the kit, provided he can solder.

The real education takes place when you complete the basic system and start to follow the course outline. Just as in a real school, there are some prerequisites. You'll need to bone up on basic digital electronics, number systems, binary and hex notation, and computer arithmetic.

While the lessons feature the 8088/8086 MPU family, the knowledge is broad-based and can be transferred to any 16-bit processor. There are ten units, each with specified objectives, review questions, an exam and experiments. Using graduated learning steps, all of the 8088's instructions are introduced and most are covered in detail. While the experiments don't teach programming per se, they do make heavy use of the built assembler and debugger.

Reaching a Climax

The course reaches a climax in unit 10, hardware interfacing. There you combine your knowledge of hardware and programming to complete a direct memory access experiment that takes about 7½ hours to build; finally you construct a simple lightpen and program in application software.

Heath estimates that it takes 100 to 120 hours to complete the course. Upon completion you should be able to describe the structure of a microcomputer, design a simple microcomputer, interface a micro to the outside world and write assembly language programs.

A noteworthy part of the ET-100 is its 32K of ROM. This includes a

CP/M-86-based assembler, screen editor and graphics debugger. The monitor is especially handy for development work since it supports serial I/O. A further aid to development is the ability to use the breadboard for prototyping without fear of harming the computer itself. Breadboard signals are buffered and include all the data and address lines, most control lines, the system clock and reset.

A Full-fledged Computer

The addition of the upgrade kit transforms the ET-100 from a mild-mannered learning tool into a full-fledged computer for home or business use. The resulting machine differs from the IBM PC in one significant way—its video display. Programs that make use of video hooks specific to the IBM are not likely to run on the ET-100. This eliminates anything that uses graphics, but it doesn't eliminate most text-only programs.

The popularity of machines like the Texas Instruments 16-bit business computer, where MS-DOS is used but the system is not completely compatible with the IBM, has started to gain the attention of many software houses. Popular programs like Lotus's 1-2-3 are starting to become available in formats for computers like the H-100 and H-120, making them useable on the Learning Computer, too.

Thanks to its compatibility with Heath's H-100 and H-120 computers, the expanded ET-100 can use the company's powerful Basic for color graphics programming. The demonstration I saw was nothing short of spectacular. And to my surprise, the programs were relatively short and straightforward.

After spending a day with the ET-100 team, it was hard to leave feeling anything but good about Heath and its line of computers. A quick inspection of the marketplace turns up no other 16-bit computer that is uniquely aimed at the educational user.

The ET could be used in most demanding schools; part of its day could be spent teaching microprocessor fundamentals to beginning students; another, more advanced, class could exploit the breadboard and debugging features; in the afternoon, put a dust cover on the machine and use it to teach programming. Last but not least, it can fill in as an administrative aide, helping with word processing, spreadsheets or database management.

As a machine for the home or office computing market, the ET-100 faces some tough competition. The price tag of a fully expanded, factory-wired version rubs up against what you would pay for an IBM or TI 16-bit system. Add the cost of software and you might find a better deal with one of the IBM clones with bundled software.

I suspect that if you're shopping for a complete system, Heath intends for you to buy its H-100 or H-120. If, however, you want to start as a student and end up as a user, you'd be hard-pressed to find an alternative better than the Learning Computer.

Obviously, a one-day "dog and pony show" doesn't give anyone a chance to fully evaluate the merits of a computer. But, on the other hand, Heath is on its third decade of selling kits. This is a contrast to many of Heath's competitors, most of which are johnny-come-lately firms.

That's not the only difference, though. No one but Heath offers a computer that you can build, use as an educational laboratory and then put to work as a hobby or professional tool.■

Up Periscope!

60 Minutes' Andy Rooney would appreciate the Periscope program, which sheds some light on the inner operation of your micro. Written in Basic for the VIC-20 and Commodore-64, Periscope will help you to understand hexadecimal and binary values.

By Gary D. McClellan and Mike Pazderka

Can you imagine Andy Rooney of 60 Minutes doing a spot on the Commodore-64 or VIC-20? It probably would sound something like this:

"And then there are those home computers. Haven't you ever wondered why they call them *home* computers? Isn't it because the owner has to stay *home* a lot just to figure out how to make the computer work?

"Of course, manuals do come with these things, but have you ever looked at one? They keep talking about *peeks* and *pokes*.

"Isn't *peek* something illegal you do with binoculars late at night? And *poke*—don't you *poke* something with a stick? Now who would want to poke his new computer with a stick? I wouldn't—would you? The manuals say you should, and all because you need to look at bits. Isn't a bit something that belongs in a horse's mouth? And who would want to poke a horse? It would probably bite you.

"That's what it says in the manual. You *poke* the machine to set the bits and you have a new byte. I certainly believe that—just like poking a horse.

"Don't you feel like you're lost in muddy water in a submarine with all these bits and bytes floating around? I certainly do. Don't you wish you had a periscope so you could see where you're going?. . ."

Periscope

The above account is, of course, speculation, but I wouldn't be surprised to hear it someday, especially with all the new users of home computers. Graphics, sound generation, communications and a number of machine configuration functions depend on the user selecting specific bits in a defined memory location, doing a peek to that location to find out what bits are set and then doing a poke to the location to set up the bit values that they need.

For those of us who sometimes have trouble thinking in hexadecimal and binary values and often wonder what values are stored in memory, the Periscope program for the Commodore-64 and VIC-20 should provide a useful tool to help us better understand our machines.

Periscope is written entirely in Basic and will allow the user to dump the hexadecimal values stored in a range of memory locations, patch (enter hexadecimal) values to a range of memory locations, disassemble hexadecimal values in a range of memory into 6502/6510 assembly language instructions, and convert number values from decimal, hexadecimal or binary to all three bases.

Program Operation

When the Periscope program is run, the first thing it does is clear the screen and display a menu of options. An option is selected by pressing a number from 1 to 5 before pressing the enter key. When a valid option has been selected, the program will display either a beginning address prompt of Yes? or a conversion prompt of (1=DEC 2=HEX 3=BIN)?.

Let's take a look at the options and see what they'll do for us.

Option 1: Dump—The dump option will display values stored in memory in hexadecimal notation (two hexadecimal digits for each byte of memory). The memory values are displayed from a beginning address to an ending address, entered from the keyboard. When the option is selected, a beginning address prompt of Yes? will be displayed.

The program then expects a two-byte (four hex digits) memory address to be entered. If a mistake is made entering an address, it cannot be corrected by backspacing, since the program doesn't recognize INST/DEL. The address data can be retyped immediately after the error on the same line, however. The program accepts the last four digits typed when the return key is pressed, regardless of how many total characters have been typed on the line.

After the beginning address has been entered, the program will respond with an ending address prompt of >. The ending address is entered in the same manner as the beginning address, with the last four digits typed considered to be the actual value.

If only two or three hex digits are entered, the program will assume that the leftmost characters are zeros. For example, if hex AE is typed and the return key is pressed, the program will assume an address of 00AE hex is intended.

After the program has the beginning and ending address for the memory dump, a Printer Output (Y/N) prompt will be displayed. A Y response will direct the output to the 1525 Commodore printer. Entering an N, or just pressing the return key, will direct output to the screen.

After the enter key is pressed, the

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program will print a hexadecimal memory address followed by eight hexadecimal values stored in memory on the Commodore-64, or six hexadecimal values stored in memory on the VIC-20. The program will continue printing memory addresses, followed by memory values in six- or eight-byte groups, until the ending address is reached or until any alphanumeric key is pressed on the keyboard when the values are being displayed to the screen.

When a key is pressed during a dump to the screen, the output will stop and the program will wait for another key to be pressed before continuing the dump. This prevents the data from scrolling off the screen *before you can read* it. If the key pressed to interrupt the display is an X, the dump will terminate and the program will redisplay the Yes? prompt. If the X key is pressed again, the program will return to the menu.

If a hexadecimal address is entered, the program will prompt for the ending address and printer output, and then dump memory values starting with the new beginning address. When the ending address is reached, the program will display the Yes? prompt and another dump can be selected, or the X key pressed to return to the menu.

Option 2: Patch—The patch option will let you enter hexadecimal values into memory. When the option is selected, the program will display the Yes? prompt. A beginning address should be entered in the same manner as with the dump option, or the X key can be pressed to return to the menu.

After a beginning address is entered, the program will display the > prompt. Enter the ending address or an X to return to the menu. After the ending address is entered, the program will display the beginning address in hex and wait for a one-byte hex value to be entered. A mistake in typing can be corrected in the same way as when entering an address; type the correct value immediately after the error. The program will accept the last two hex digits in the line as the correct value to place in memory.

The program will continue to display the next sequential memory location and wait for a value to be entered. This sequence will continue until the ending address is reached, or until the X key is pressed. If the X key is pressed, the entry routine will terminate and a Yes? prompt will be displayed. As with the dump option, a new set of addresses may be entered, or the X key pressed again to return the program to the menu.

Option 3: Disassemble—The disassemble option will display a section of memory as 6502/6510 assembly language instructions. The routine translates the hexadecimal value in a memory location for a particular 6502/6510 machine language instruction into a 6502/6510 assembler language mnemonic for that instruction and displays it. The routine then displays the memory values for the next one or two memory locations, if required by the addressing mode of the machine language instruction.

The disassemble option prompts and entries are exactly the same as for the dump option. The beginning and ending address prompts are displayed; the printer output prompt also is displayed. For either address prompt, the X key can be pressed to return to the menu. While the disassembly is being printed to the screen, the routine can be interrupted in the same manner as the dump routine. A new section of memory—or a return to the menu—then can be specified.

Option 4: Convert—The convert option will convert a numeric value entered as a decimal, hexadecimal or binary number into the remaining two number bases and display the values on the screen. When this option is selected, the program will display the convert prompt, (1=DEC 2=HEX 3=BIN)?. A number corresponding to the desired numeric base should be pressed, or the X key pressed to return to the menu. After a numeric base has been selected, the program will display a prompt of DEC?, HEX? or BIN?. The program then waits for a value to be entered in the base notation prompted for.

Decimal numbers should be in the range of 0 to 65535 without spaces between the digits. Hexadecimal numbers can be up to four hex characters in length and are entered in exactly the same manner as the address prompt entries. Binary numbers can be from one to 16 digits of 1s and 0s. As with a decimal number, spaces between the digits will result in an incorrect answer. When entering a decimal or binary number, the delete key can be used to backspace and correct the entry before the enter key is pressed.

```
READY.
600 REM ******************************
601 REM *                            *
602 REM *       # PERISCOPE #        *
603 REM * FOR COMMODORE-64 AND VIC 20 *
604 REM *                            *
605 REM *  WRITTEN BY MIKE PAZDERKA   *
606 REM *  AND GARY D. MCCLELLAN      *
607 REM *  P.O. BOX 1750              *
608 REM *  FLAGSTAFF, AZ   86002      *
609 REM *                            *
610 REM ******************************
611 DIMM$(56),O%(255):FORP=0TO56:READM$(P):NEXT:FORP=0TO255:READW
615 IFW(99THENW=W*100
620 O%(P)=W:NEXT
630 PRINTCHR$(147):R=0:PRINTCHR$(18);"* PERISCOPE HERE! *":PRINT:PRINT"1) DUMP"
640 PRINT"2) PATCH":PRINT"3) DISASSEMBLE":PRINT"4) CONVERT":PRINT"5) END":PRINT
645 INPUT"OPTION ";C:IFC)3ORC(1THEN655
650 GOSUB665:GOSUB970:IFRTHEN630
655 ONCGOSUB900,800,700,670,660:R=0:IFC)3THEN630
659 GOTO650
660 GOSUB665:END
665 IFL=1THENPRINT#4:CLOSE4:L=0:P$=""
667 RETURN
670 R=0:PRINT"(1=DEC 2=HEX 3=BIN) ?"
672 GETK$:IFK$=""THEN 672
674 IFK$="X"THENRETURN
676 IFK$="1"THENPRINT"DEC";:E=0:INPUTE:P=E:GOSUB696:GOSUB690
678 IFK$="3"THENPRINT"BIN";:GOSUB684:GOSUB696
680 IFK$="2"THEN PRINT"HEX?";:GOSUB980:IFR(1THENGOSUB688:GOSUB690
682 PRINT:GOTO670
684 E=0:Q=0:K$="0":INPUTK$:FORX=LEN(K$)TO1STEP-1:Q=Q+1
686 E=E+VAL(MID$(K$,Q,1))*2^(X-1):NEXTX:GOSUB688:RETURN
688 PRINT"DEC=";E:RETURN
690 PRINT"BIN=";:FORX=15TO1STEP-1:Q=0:IFE-2^X)=0THENE=E-2^X:Q=1
692 IFX=7THENPRINT" ";
694 PRINTRIGHT$(STR$(Q),1);:NEXTX:PRINTRIGHT$(STR$(E),1):RETURN
696 P=E:PRINT"HEX=";:GOSUB950:PRINT:RETURN
698 P=E:NEXTP:PRINT:RETURN
700 GOSUB990:FORP=STOE:IFLTHEN710
705 GOSUB895:IFRTHEN698
710 GOSUB950:W=O%(PEEK(P)):Z=INT(W/100):W=W-Z*100:PRINT" ";M$(Z);"  ";
720 ONWGOSUB725,780,735,740,782,750,755,760,765,770,773,775:PRINT:NEXT:RETURN
725 PRINT"#";:GOTO780
735 GOSUB780:PRINT",X";:RETURN
740 GOSUB780:PRINT",Y";:RETURN
750 GOSUB782:PRINT",X";:RETURN
755 GOSUB782:PRINT",Y";:RETURN
760 P=P+1:Q=P:H=PEEK(P):IFH)127THENP=P-256
763 P=P+1+H:PRINT"$";:GOSUB950:P=Q:RETURN
765 PRINT"(";:GOSUB780:PRINT",X)";:RETURN
770 PRINT"(";:GOSUB780:PRINT"),Y";:RETURN
773 PRINT"A";:RETURN
775 PRINT"(";: GOSUB782:PRINT")";:RETURN
780 PRINT"$";:P=P+1:H=PEEK(P):GOTO920
782 PRINT"$";:P=P+2:H=PEEK(P):GOSUB920:H=PEEK(P-1):GOTO920
783 DATA???,ADC,AND,ASL,CMP,EOR,LDA,ORA,SBC,STA,BCC,BCS,BEQ,BIT,BMI,BNE,BPL,BRK
784 DATABVC,BVS,CLC,CLD,CLI,CLV,CPX,CPY,DEC,DEX,DEY,INC,INX,INY,JMP,JSR,LDX,LDY
785 DATALSR,NOP,PHA,PHP,PLA,PLP,ROL,ROR,RTI,RTS,SEC,SED,SEI,STX,STY,TAX,TAY
786 DATATSX,TXA,TXS,TYA,17,709,,,,702,302,,39,701
787 DATA311,,,705,305,,1608,710,,,,703,303,,20,707,,,,706,306,,3305,209,,,1302
788 DATA202,4202,,41,201,4211,,1305,205,4205,,1408,210,,,,203
789 DATA4203,,46,207,,,,206,4206,,44,509,,,,502,3602,,38,501,3611,,3205,505,3605
790 DATA,1808,510,,,,503,3603,,22,507,,,,506,3606,,45,103,,,,102,4302,,40,101
792 DATA4311,,3212,105,4305,,1908,110,,,,103,4303,,48,107,,,,106,4306,,
793 DATA909,,,5002,902,4902,,28,,54,,5005,905,4905,,1008,910,,,5003,903,4904,,56
794 DATA907,55,,,906,,,3501,609,3401,,3502,602,3402,,52,601,51,,3505,605,3405,
795 DATA1108,610,,,3503,603,3404,,23,607,53,,3506,606,3407,,2501,409,,,2502
796 DATA402,2602,,,31,401,27,,2505,405,2605,,1508,410,,,,403,2603,,21,407,,,,406
797 DATA2606,,2401,809,,,2402,802,2902,,30,801,37,,2405,805,2905,,1208
798 DATA810,,,,803,2903,,47,807,,,,806,2906,
800 FORP=STOE:GOSUB950:PRINT"{SS}";:H$="":GOSUB820:IFRTHEN698
810 POKEP,H:PRINT:NEXT:RETURN
820 GETK$:IFK$=""THEN820
830 W=ASC(K$):IFW=88THENR=1:RETURN
840 IFW=13ANDLEN(H$))1THEN870
850 IFW(48OR(W)57ANDW(65)ORW)70THEN820
860 PRINTK$;:H$=H$+K$:GOTO820
870 W=ASC(RIGHT$(H$,2))-48:IFW)9THENW=W-7
880 W=W*16:H=ASC(RIGHT$(H$,1))-48:IFH)9THENH=H-7
890 H=H+W:RETURN
895 GETK$:IFK$=""THENRETURN
897 IFK$="X"THENR=1:RETURN
898 WAIT198,1:POKE198,0:RETURN
900 GOSUB990:FORP=STOE:IFINT((P-S)/8)=(P-S)/8THENPRINT:GOSUB950
905 IFL=0THENGOSUB895:IFRTHEN698
910 H=PEEK(P):PRINT"{SS}";:GOSUB920:NEXT:PRINT:RETURN
920 W=INT(H/16):H=H-W*16:GOSUB930:W=H
930 W=W+48:IFW)57THENW=W+7
940 PRINTCHR$(W);:RETURN
950 H=INT(P/256):Z=P-H*256:GOSUB920:H=Z:GOTO920
970 PRINT"YES?";:GOSUB980:IFRTHENRETURN
975 S=E:PRINT")";
980 H$="":GOSUB820:IFRTHENRETURN
985 H$="00"+H$:E=H:H$=MID$(H$,LEN(H$)-3,2):GOSUB870:E=E+H*256:PRINT:RETURN
990 L=0:INPUT"PRINTER OUTPUT (Y/N)";P$:IFLEFT$(P$,1)="Y"THENL=1:OPEN4,4,0:CMD4
993 RETURN
READY.
```

Program listing. Periscope program, designed for Commodore-64 or VIC-20.

When a value has been entered, the program will display the converted value in the two other number bases supported. A decimal number will be displayed as an integer value. A hexadecimal number will be displayed as four hex characters. A binary number will be displayed as two groups of eight digits (the binary representation of two bytes).

After the converted values are displayed, the program will display the (1=DEC 2=HEX 3=BIN)? prompt and another base and value can be entered, or the X key pressed to return to the menu.

Option 5: End—The end option checks to make sure the printer is disabled and then ends the program and returns control to the Commodore Basic screen editor.

Program Description

The Periscope program was designed to provide a useful utility while using as little memory as possible. With this in mind, as many statements as possible are packed into each program line. REM statements weren't used for the same reason. When the program is entered, lines 600–610 should be discarded to save space. The program will then take up approximately 3000 bytes of memory when entered, and approximately 3785 bytes of memory when run.

The program can be condensed further by using the abbreviated two-key commands supported by Commodore Basic. For example, lines 611 and 615 can be combined. The data statements in lines 783–798 can be condensed into fewer total lines. The program was written as it is to make it easier to enter the listing, since lines built with abbreviated two-key commands usually exceed 80 characters on the Commodore-64 and 88 characters on the VIC-20 when listed to the screen. Even though the tokenized line fits into a basic line in memory, the line cannot be edited on the screen without losing data, so the line must be retyped from scratch to correct mistakes. The program should be typed in as listed, run to indicate any errors, and corrected. After it runs correctly, it can be further condensed.

The program listing can be used as is on a Commodore-64. One line should be changed to run the program on the VIC-20. In line 900, the value (P–S)/8 appears twice. Change 8 to 6 in both places, and the dump option will fit the VIC-20 screen width.

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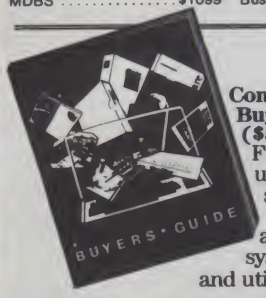

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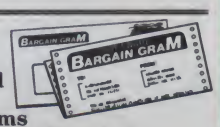

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may want to delete certain options to give you more free memory space when you run Periscope. For example, by deleting lines 670–696 and by deleting the value 670 from line 655 and PRINT "4) CONVERT:" from line 640 and then changing PRINT "5) END" to PRINT "4) END", the entire convert option will be removed from the program. As a means for further modification of the program, a description of the routines follows.

Lines 611–620: This routine initializes and fills two arrays with data. Array M$ contains a character string for each 6502/6510 assembly mnemonic. Array O% contains packed values that, when unpacked, provide a pointer into array M$ and a pointer to appropriate subroutines for printing a specific 6502/6510 addressing mode.

Lines 630–659: These lines contain the main program routine, which displays the menu of options in lines 630 and 640, inputs the option selected in line 645 and calls the printer reset and address entry subroutines in line 650. Line 655 vectors the program to the appropriate option subroutine.

Lines 665–667: This routine is called to disable output to the printer.

Line 660: This line calls the printer disable routine and then ends the program.

Lines 670-696: The convert option routine prints the convert prompt in line 670. Lines 672–682 input the base selection, print the number base prompt and call the conversion subroutines. Lines 684–686 convert a binary entry into a decimal number and then call the decimal number print routine at line 688.

A decimal number is converted to binary, and then printed as a 16-bit binary number in lines 690–694. Line 696 calls a subroutine at line 950; this subroutine converts a decimal number to hexadecimal and prints the hexadecimal characters.

Line 698: This routine provides a method for bailing out of a For... Next loop and returning to the menu. If a subroutine is exited without doing a return, or if a For...Next loop is exited early, the 6502/6510 stack register will fill up with garbage and result in an Out Of Memory error when there is actually machine memory available. This routine tidies up the machine internals when bailing out of a loop.

Lines 700–782: This routine contains the disassemble option. Line 700 calls the printer enable subroutine, and then initiates a For...Next loop from a beginning to ending memory address. If the printer is enabled, the program then jumps to line 720. Otherwise, line 705 is executed; it calls the interrupt routine at line 950 to check for a stop output condition.

The program then loads a value from a memory address and uses this value to point to an element in array O%. The array element is then divided by 100 to point to an assembler language mnemonic in array M$. The division results in an integer number that is then multiplied by 100 and subtracted from the value of the element of array O%. The result is used in line 720 to direct the program to the correct subroutine to print the operand in the required 6502/6510 addressing mode. These subroutines are located from line 725 to line 782.

Lines 783–798: These lines contain the data values used to load array M$ and array O% when the program is first run.

Lines 800–810: This routine contains the patch option. A For...Next loop starts in line 800 from the beginning to the ending address. The program then calls the decimal-to-hexadecimal

conversion routine at line 950 and prints a memory location. The hex input subroutine is called at line 820, and the entered data is written to the memory location by line 810.

Lines 820-890: This routine inputs two hexadecimal characters from the keyboard and converts the value to a decimal number. The routine sets a return flag (R) to 1 if an exit from the routine is requested by the X key being pressed.

Lines 895#898: This routine is the interrupt request subroutine called by the dump and disassemble options to check for a stop output request.

Lines 900-910: This routine contains the dump option. Line 900 calls the printer enable subroutine, and then initiates a For...Next loop from beginning to ending address. The program then checks for end-of-screen condition, and then calls the decimal-to-hexadecimal conversion routine at line 950. Line 905 calls the interrupt request subroutine at line 895 if output is being displayed to the screen, and then loads a value from a memory location and calls the decimal-to-hexadecimal conversion and print routine at line 920.

Lines 920-950: This routine converts a decimal number into hexadecimal characters. If entered at line 950, four hexadecimal characters are printed. If entered at line 920, two hexadecimal characters are printed.

Lines 970-975: This routine is the beginning and ending address entry routine. The Yes? prompt is printed by line 970, and then the program calls the hex address to decimal address calculation routine at line 980 and 985.

Line 980 clears variable H$, calls the hex character input routine at line 820 and then executes line 985 to convert the hex characters to a decimal number.

Lines 990-993: This subroutine prints the printer output prompt and enables the printer when answered by a Y response from the keyboard.

Conclusions

The Periscope program provides a useful utility and simple monitor for entering and displaying machine language programs. Its purpose is to help newer users of the Commodore-64 and VIC-20 to get to know their machines better. It also provides a way to enter short programs written in 6502/6510 machine language hex codes into the machines. With this program running, and with a copy of *The Programmer's Reference Guide* for the Commodore-64 or VIC-20 at hand, the inner workings of either machine should become more understandable.

(For those readers who dislike typing listings into their machines, send a self-addressed stamped mailer, a blank tape and $3 to Wizard Works Software Engineering, and we'll send you a copy of the program.)■

```
[■PERISCOPE■HERE■]

1) DUMP
2) PATCH
3) DISASSEMBLE
4) CONVERT
5) END

OPTION ? 1
YES?C200
>C220
PRINTER OUTPUT (Y/N)? N

C200 A9 32 20 D2 FF 60 FF FF
C208 FF FF FF FF FF FF FF 00
C210 FF FF FF FF FF FF FF FF
C218 00 FF FF FF FF FF FB 04
C220 FF
YES?C100
>C10F
PRINTER OUTPUT (Y/N)? N

C100 FF 00 FF 00 FF FF FF FF
C108 FF FF FF FF FF FF FF 00
YES?

[■PERISCOPE■HERE■]

1) DUMP
2) PATCH
3) DISASSEMBLE
4) CONVERT
5) END

OPTION ? 2
YES?C200
>C205
C200 A9
C201 32
C202 20
C203 D2
C204 FF
C205 60
YES?C206
>C207
C206 00
C207 00
YES?

[■PERISCOPE■HERE■]

1) DUMP
2) PATCH
3) DISASSEMBLE
4) CONVERT
5) END

OPTION ? 3
YES?C200
>C20A
PRINTER OUTPUT (Y/N)? N
C200 LDA  #$32
C202 JSR  $FFD2
C205 RTS
C206 BRK
C207 BRK
C208 ???
C209 ???
C20A ???
YES?

[■PERISCOPE■HERE■]

1) DUMP
2) PATCH
3) DISASSEMBLE
4) CONVERT
5) END

OPTION ? 4
(1=DEC 2=HEX 3=BIN) ?
HEX?C200
DEC= 49664
BIN=11000010 00000000

(1=DEC 2=HEX 3=BIN) ?
DEC? 1024
HEX=0400
BIN=00000100 00000000

(1=DEC 2=HEX 3=BIN) ?

[■PERISCOPE■HERE■]

1) DUMP
2) PATCH
3) DISASSEMBLE
4) CONVERT
5) END

OPTION ? 4
(1=DEC 2=HEX 3=BIN) ?
BIN? 11110000
DEC= 240
HEX=00F0

(1=DEC 2=HEX 3=BIN) ?
BIN? 1111000010101010
DEC= 61610
HEX=F0AA

(1=DEC 2=HEX 3=BIN) ?

[■PERISCOPE■HERE■]

1) DUMP
2) PATCH
3) DISASSEMBLE
4) CONVERT
5) END

OPTION ? 5

READY.
```

Fig. 1. Sample run of Periscope program.

Space Reservations Confirmed

This useful utility lets the more serious Timex/Sinclair user make use of space in upper memory.

By John Jainschigg

```
POKE 16388, (RAMTOP - #bytes) - INT ((((RAMTOP - #bytes)/256) * 256))
POKE 16389, INT ((RAMTOP - #bytes)/256)
NEW
```

Listing 1. Usual approach to RAMTOP reset.

```
ADDRESS/MNEMONIC  /  CODE

16515   SCF            55                ;
16516   CCF            63                ; clear carry
16517   LD(16507)SP    237,115,123,64    ; store SP
16521   LD BC(16507)   237,75,123,64     ; SP into BC
16525   LD HL(16388)   42,4,64           ; RAMTOP into HL
16528   SBC HL,BC      237,66            ; RAMTOP-SP=sector length
16530   LD DE,HL       84,93             ; result in DE
16532   LD BC,OFFLO,
            OFFHI      1,0,0             ; offset into BC
16535   LD HL(16388)   42,4,64           ; RAMTOP into HL
16538   SBC HL,BC      237,66            ; RAMTOP-offset=new value
16540   LD(16388)HL    237,99,4,64       ; into RAMTOP
16544   LD HL(16386)   42,2,64           ; ERR-SP into HL
16547   SBC HL,BC      237,66            ; ERR-SP-offset=new value
16549   LD(16386)HL    237,99,2,64       ; into ERR-SP
16553   LD HL(16507)   42,123,64         ; SP into HL
16556   SBC HL,BC      237,66            ; SP-offset=new value
16558   LD SP,HL       249               ; into SP
16559   LD BC,DE       66,75             ; length of block into BC
16561   LD DE,HL       84,93             ; dest. of move into DE
16563   LD HL(16507)   42,123,64         ; start address into HL
16566   LDIR           237,176           ; block copy loop
16568   RET            201               ; return to BASIC
16569   AND A          151               ; clear carry
16570   LD(16507)SP    237,115,123,64    ; store SP
16574   LD HL(16507)   42,123,64         ; SP into HL
16577   LD BC(16412)   237,75,28,64      ; STKND into BC
16581   SBC HL,BC      237,66            ; det. free space
16583   LD BC,HL       68,77             ; result into BC
16585   RET            201               ; and out
```

Listing 2. Spacemaker subroutine—an alternative approach to RAMTOP reset.

Every Sinclair ZX-81 (and TS-1000) programmer must be familiar with the technique of resetting the system variable RAMTOP to procure space in upper memory.

RAMTOP reserve space has several intriguing qualities: it is immobile and entirely immune to functions of Basic ROM (such as NEW and LOAD), making it ideal not only for the storage of machine code routines, but also a tempting resource for use in binary data storage schemes and program-to-program communications. Unfortunately for those who wish to experiment with these more exotic applications, the simple Basic procedure most commonly used for RAMTOP reset is inappropriate for several reasons.

Normal Approach

Listing 1 demonstrates the usual approach. The Basic statements are entered from command mode on power-up.

The number of bytes of storage space required is subtracted from the normal value of RAMTOP (corresponding to the current configuration of the TS-1000), and the result is poked to the system variable in high/low format. A NEW command then should

Address correspondence to John B. Jainschigg, 308 East 90th St., New York, NY 10028.

1	2	3	4	5	6	7	8	9	10
system variables	program	display file	variables	keyboard buffer	calculator stack	FREE	machine stack	GOSUB	RAMTOP reserve
16384	16509	D-FILE	VARS	E-LINE	STKBOT	STKEND	Stack pointer	ERR-SP	RAMTOP

Fig. 1. Memory map showing ROM patterns of the TS-1000/ZX-81.

be executed to zero system RAM and to rearrange it beneath the new RAMTOP address.

NEW is the only Basic command that incorporates reformatting. Unfortunately, it does so in a manner destructive to the contents of memory, for which reason a Basic program cannot use a runtime variant of the above procedure to create space in high memory for its own use. Instead, the user must anticipate the need for RAMTOP reserve and create it prior to loading application programs.

This two-step obligation is cumbersome in itself, and the result of it has been to limit the use of RAMTOP reserve space by Basic programmers to schemes requiring predictable amounts of offset—offset that can be calculated and prepared ahead of runtime.

Another Way

The subroutine Spacemaker (see Listing 2) constitutes an alternative approach to RAMTOP reset. Spacemaker creates RAMTOP reserve space in a nondestructive way—by reformatting the upper end of system memory. It allows a Basic program that incorporates it to conjure any degree of RAMTOP offset during execution and to put that space to immediate use.

The mechanics of the subroutine are simple. When power is first applied to the TS-1000, the bootstrap procedure of the ROM formats available memory in the pattern shown in the memory map (Fig.1). The various partitioned blocks are herded into two broad sectors above and below a central reservoir of free space. The upper sector of system memory, comprising the gosub and machine stacks, is based at RAMTOP and builds downward, starting at the address immediately beneath the RAMTOP boundary.

Besides RAMTOP, two additional pointers define the upper sector: the system variable ERR-SP, which marks the top (read "bottom") of the gosub stack, and the stack pointer register which marks the top (as above) of the machine stack. Creating RAMTOP reserve space is a matter of shifting the upper sector of system memory downward by the desired offset, and altering RAMTOP, ERR-SP and the stack pointer by the same value so that they point once more to appropriate addresses.

Basic is not a practical tool for this operation, however. One reason is that the stack pointer, an internal register of the Z-80 processor, cannot be changed directly by Basic commands. Another is that the block of bytes we wish to move is used intensively by the Basic system to manage program execution.

The solipsistic conflict that would result from trying to use Basic to relocate bytes whose values are simultaneously required to manage the relocation would likely result in a system crash (how's that again?). In machine code, though, the procedure is extremely straightforward, as the subroutine's comments will show.

The Basic loader in Listing 3 serves to place the decimal opcodes of Spacemaker in a REM statement #1, 71 bytes in length, starting at address 16515 at the beginning of your Basic program listing. To use the subroutine, incorporate steps into the body of the program to poke the number of bytes of space required, in high/low format, to subroutine variables OFFLO and OFFHI at addresses 16533 and 16534. Spacemaker then may be

```
1 REM "(71 spaces)"
5000 FOR X=16515 TO 16585
5010 INPUT A
5020 PRINT A;" ";
5030 POKE X,A
5040 NEXT X
```

Listing 3. Basic loader.

called via a statement RAND USR 16515.

Note

When using Spacemaker, be careful not to set off more free space than is currently available to Basic. If you do, the utility will copy the upper end of the system RAM over the calculator stack, and a dazzling system crash will result. To help forestall this catastrophe, Spacemaker incorporates a subutility, Free (in bytes 16569–16585), which calculates how much space you have available. Free should be called prior to Spacemaker by incorporating the statement:

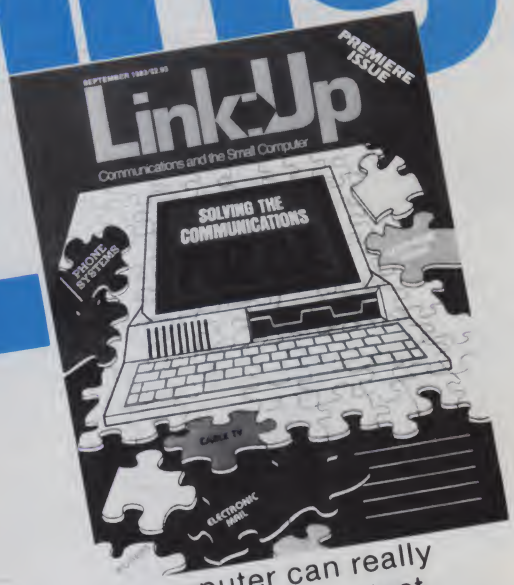
LET SPACE = USR 16569

into your Basic program. As long as the value returned for Space is somewhat greater than the number of bytes you wish to reserve, you should be okay.

The subroutine uses the free double byte at 16507 and 16508 as a storage register during execution. The routine is relocatable as long as the new locations of OFFLO and OFFHI are taken into account, and the relevant poke statements are altered accordingly.■

Circle 300 on Reader Service card.

Nothing Else.



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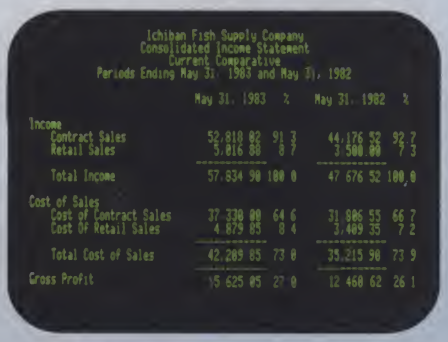

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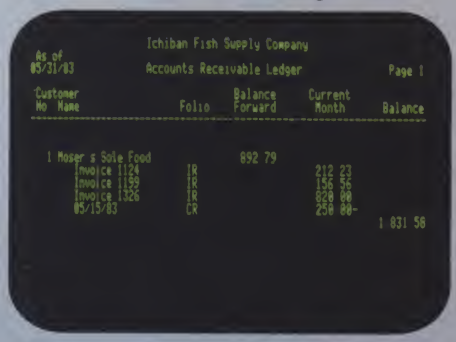

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The NEC 8023A: A New Breed of Printer

NEC's dot-matrix printer features versatility that is unmatched by anything under $1000. Selling for $695, the 8023A offers 100 cpi, good graphics, a proportional space mode and other impressive features.

By Bruce D. Carbrey

When you look at today's crop of low-cost printers, it seems almost impossible that only five years ago about the only thing you could get in the $500 range was a reconditioned Teletype that clanked along at ten characters per second—if you were handy enough to rig up your own 30 milliamp interface and figure out how to convert from ASCII to Baudot code!

Now, thanks to on-board single-chip microcomputers, printers have standard features that would have seemed right out of Fantasyland back when the Model 33 was the only game in town. The NEC 8023A typifies this new breed.

I looked for a printer for a long time before the NEC 8023 came along. When it did, I didn't take long to make up my mind. This was the first printer that fit my budget, had reasonable speed for listings (100 characters per second), had good dot-matrix graphics and could produce adequate quality printing for documentation.

I was amazed to discover that it could also print proportional-width characters and microspace between them. This feature is found infrequently in printers costing four times as much. A little comparison shopping revealed that I could find the printer discounted at under $500, so I ordered one.

The first thing I noticed when I opened the carton and took out my new printer was that it is heavy for its size, much heavier than an Epson MX-80. A quick under-the-hood inspection revealed the reason—metal.

Inside the plastic case is a lot more metal than most of the other small printers I've seen. The head/ribbon mechanism slides on a half-inch metal cylinder in a metal chassis. Instead of the familiar "rubber band" drive belt, the print mechanism is moved by a cable on steel pulleys, similar to the Diablo Hytype II.

The next thing I noticed was the strange placement of the pin-feed mechanism. Instead of pulling the paper in the conventional fashion, the 8023 sprockets push the paper under the platen from behind.

At first, I had some doubts about this arrangement, but I have since discovered the beauty of it.

Since paper passes over the pin feed before it reaches the printhead, you don't have to waste the first sheet of paper when lining up the top of the form under the printhead. There's a nice slot for loading single sheets from the top of the printer, too. I fed some fanfold paper in from behind the unit with no problem, and then I fired it up.

That's when I found my first problem with the NEC. The printer produces a high-pitched hum when it is on—about 12kHz, I'd guess. In a normally noisy office or when actually printing, this hum is not noticeable. But in a quiet room it can become annoying to the point where I turn it off when not actually printing. I thought this might be a problem with my particular printer, but I have now seen three other 8023s, and they all hum.

Following the instructions, I held down the TOF (top of form) button while turning on the power switch to activate the self-test. The printer functioned perfectly, printing out its character set in a variety of character

NEC's 8023A is a dot-matrix printer that prints 100 cpi and costs $695.

Address correspondence to Bruce Carbrey, 704 Currituck Drive, Raleigh, NC 27609.

sizes. Then I set out to hook it up to my computer.

Two manuals are furnished with the printer. One is the regular typeset manual that is oriented towards operation with the NEC computer. The other is a photocopied manual printed for Apple owners.

If you own an Apple or a NEC computer, the manuals are fine. I don't. All the essential information is there for other computers; it just takes a little longer to dig it out.

There is a summary of programming codes in the back of the manual, but in order to get a narrative description of how to use them, you need to refer to the front section, which gives examples in NEC Basic.

The Apple manual appears to be comprehensive and explains how to deal with all the idiosyncrasies of the Apple, such as the fact that the Apple outputs the most significant bit high. The 8023 normally expects bit 7 to be high only when the extended character set (i.e., Greek) is being selected. Fortunately for Apple users, the full character set can still be used by setting a DIP switch on the printer to ignore bit 7; instead it uses an escape sequence to select the extended font.

After I had connected my cable to the parallel port of my computer and had written a software driver, I thought I was in business, but the NEC refused to print. A recheck of the manual revealed that the printer is shipped from the factory with the DIP switches set so that the printer is not selected on power-up. It must be enabled by pushing the SEL button. Not seeing much logic in this choice, I changed the DIP switches to have the printer ready when it was turned on, and it ran like a champ.

Programming the various modes of the 8023 is easy. Most mode changes are made by sending an ASCII ESC character (1B hex or 27 decimal) followed by a one-character selection code. For example, ESC, P selects proportional type and ESC,E selects elite type.

These can be output directly from Basic if you wish. To select bit-mapped graphics mode, you send ESC, S, followed by four decimal digits specifying the number of bytes of graphics data to follow. Each succeeding byte represents eight vertical dots to be printed, one per bit. Normally you send a whole line of bytes and then a CR (carriage return).

When I first wrote my graphics driver, I had trouble getting good vertical alignment between adjacent lines. Vertical lines appeared wavy on the page. After a little experimenting, I determined that this was apparently causing lines to start slightly out of position.

Luckily the cure was simple. Just send two carriage returns (but only one linefeed). Sending the second carriage return will correct the bounce and give the lines nearly perfect alignment.

Another potential small problem with the graphics mode is that the 8023 doesn't have master reset command available from software. This means that if you abort a program that is printing graphics, you will have to turn the printer off and back on before it will respond properly to input. This is because it is still interpreting all incoming characters as the remaining

A Capsule Look At the NEC 8023 Printer

Manufacturer
NEC America, Inc., Consumer Products Division, 1401 Estes Ave., Elk Grove Village, IL 60007

Price
$695

Features
Eight different character sizes; full upper and lowercase (with descenders) ASCII character set plus 120 additional characters, including Greek and character graphics; jumpers to enable specialized fonts for U.S., United Kingdom, Germany, Sweden or Japan; lines up to 136 columns wide in compressed mode; proportional type with microspacing between characters; bidirectional logic-seeking printing; 100 cps maximum print rate; 7 by 9 dot matrix character cell; 8 by n dot matrix graphics up to 1280 dots wide; line spacing of 1/6, 1/8 inch or N/144 inch; forward and reverse paper feed; pin and friction feed; paper width 4 to 10 inches; fanfold, roll or single sheet paper; one original plus three copies; parallel interface; out-of-paper detector; cartridge ribbon; self-test.

Interface
Parallel interface standard, using a standard 36 pin D connector (only two control and eight data lines are actually used); RS-232 serial interface optional.

Documentation
Seventy-eight-page user manual; 43-page supplement for Apple users.

graphics bytes.

The 8023 has a remarkable repertoire of characters and fonts. When smaller character sizes are selected, the motor slows down, so that the 100 cps (characters per second) specification applies only to the standard pica type. Selecting the enhanced mode, which increases the dot density of characters, also slows down the printing process. The paper can be advanced in either direction. To back up, you send an ESC, r (for reverse). Thereafter, all linefeeds will be in the reverse direction until you send an ESC, f.

You can select the size of a linefeed in units of 1/144 inch. This makes it easy to issue a half-line feed in either direction for subscripts or superscripts. There is a problem here, though. Due to backlash in the paper advance mechanism, a backward linefeed followed by a forward linefeed will not return the printhead to the same position it started on. This can be alleviated considerably by using only friction feed instead of pin feed. The designers evidently noticed this too, because page 2 of the manual cautions: When mixed printing in both the forward and reverse directions is to be performed, care must be exercised in loading the paper, since the paper may slip, causing improper printing while being fed by pin or by friction.

Unfortunately, I couldn't find any amount of "care" that could completely solve the problem. Also, although the manual doesn't say so, line feeds can only be issued in "incremental mode," not in bidirectional mode.

> The graphics printing of the NEC 8023 is the best I've seen on a small printer.

One of the most engaging features of the 8023 is the proportional print mode. When using the proportional font, all characters are not the same width, but occupy a "natural" amount of space, just like newsprint.

If you print two lines with the same number of characters in each line, the lines in general won't be the same width unless they have the same characters in them. A table in the back of the manual gives the width of each character, from seven to 16 dots.

After each proportional character is printed, you can move the printhead to the right by zero to six dots; this is called "microspacing." To achieve an attractive, flush-right justification of printed text, a special print program can be used. The general idea of the program is as follows. For each line, the total number of dots occupied by characters is computed by adding up the width of each individual character, using a table of character sizes. This width is subtracted from the total desired column width in dots. Dividing this number by the number of characters in the line will give the number of dots of microspacing that need to be sent after each character. The resulting output is much more attractive than inserting extra blanks between words to achieve flush-right justification.

As long as you stick with normal text, the 8023 works fine using proportional mode and microspacing. Unfortunately, if you try to do anything tricky, such as printing characters in the extended character set, subscripting, superscripting or backspacing (which the 8023 can do!), the printer apparently becomes "confused" about where it should be printing and prints in the wrong place. I would guess this is symptomatic of a bug in the ROM software driver for the 8023's microprocessor. If you don't use microspacing between characters, it works fine except for backspace.

The only other complaint I have with the printer concerns the horizontal placement of the pin-feed sprockets. The left sprocket can't be moved far enough to the left to allow you to print a listing more than ¼-inch from the left edge.

You can partially solve this problem by sending the printer a software command to move the left margin over by a specified number of spaces. Unfortunately, if you tell the printer to move the left margin over four spaces, it automatically sets the right margin to 76 instead of 80, so now you can't print the full 80 columns. I wouldn't mind if the right margin were reduced instead; I just want to be able to punch my printout for a three-ring binder without punching holes in the text. Maybe the printer is too smart for its own good in this case!

I've had my 8023 for ten months now, and have really given it a thorough workout. I suspect that most of the little bugs I've discovered probably would go completely undetected and unnoticed in more normal use. I've totally worn out three ribbons, and printed several 200-page listings without a bit of trouble.

Unlike several other printers I have used, which got hot and started overprinting lines when faced with long listings, the NEC stays cool and correct even after four hours of continuous printing. Although the manufacturer does not quote a specification for printhead life, the head has a big finned heat sink and looks like it should have a long life.

The graphics printing of the NEC is the best I've seen on a small printer, and doesn't require an extra cost ROM. In the enhanced mode, the characters produced by the NEC are of good quality; not as good as a daisy wheel printer, of course, but close. In terms of versatility, I think this printer is unmatched by anything under $1000. Since I bought my 8023, I've had the opportunity to extensively use a number of other printers, including the Epson MX-80 and MX-100, the IDS Paper Tiger series and the new IDS Prism. I'm sure I made the right choice.■

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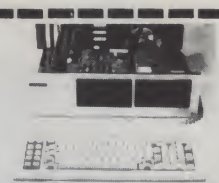

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Disk User or Disk Duffer?

If you're a micro disk dilettante, then this first of a two-part article will help you get the most out of your disk system through random access file use.

By Dan Bishop

Are you a Disk User or a Disk Duffer?

A Disk User makes the most out of the capabilities of a disk system and uses random access disk files like they were going out of style. A Disk Duffer avoids random access files if at all possible, settling for the more easily understood, but clumsier, sequential access approach.

Having cut his teeth on cassette data storage, the duffer finds the transition to disk easier to make if the disk files are set up using sequential access. Never mind the fact that the beautiful advantage of a disk system is its random access capability with the corresponding increase in speed and efficiency. Random access is too hard to figure out, right?

Wrong! In fact, random access need not even be understood in order to be used effectively. Of course, if you're dealing with field statements and subrecords, and if you're calculating a subrecord's position within a record and handling all of the nitty-gritty details, random access can be difficult to use without considerable experience. However, most of the work with random access disk files can be handled by the computer.

By using a standard set of program instructions that will handle any random access file, you can write rather complicated programs in which all of the information pertinent to a specific application is entered using simple data statements. Let the computer worry about opening the files, positioning the subrecords, fielding the buffer and getting or putting the records. As long as your data statements are correct, the random access to disk information will proceed smoothly.

In this article, I'll provide the Basic instruction set that will uncomplicate the random access I/O procedures, and I'll explain how to use the MID$ functions to help accomplish this goal. I'll also describe a sample program in which you use these techniques; it'll allow you to set up a 366-day datebook calendar for recording special dates and appointments.

Preliminary Planning

As with any programming project, the effectiveness of the resulting program is determined to a large extent during the initial planning stages. It is necessary to accurately predict just what information will need to be stored on disk and how that information should be arranged.

One of the characteristics of random access files is that predefined field lengths are used for each item of information they contain.

You'll need to know how many bytes of memory storage to allocate to each item being stored. If you're storing names, will 20 characters be sufficient, or should we use 25? Should a given number be stored as an integer (requiring two bytes), a single-precision number (requiring four bytes) or a double-precision number (requiring eight bytes)? The answers to these questions will determine how we set up our disk files.

The first step is to make a list of all of the items that will need to be stored for each record. Beside each item in the list, write the number of bytes you expect to use for that item. (A mail list program may require only a small number of items, such as name, address, city, state and zip code. An accounts receivable or inventory program may have dozens of items relating to each record.)

It's good practice at this point to think about possible applications that are not being done, but which might be useful, and to include additional items for each record, allowing the program to support such future innovations.

Now look at the list and categorize the items according to function. Decide if you want all of the information you have listed in a single file or if you

File Name: MAILLIST/DAT
Total Bytes per Subrecord: 51

Number of Bytes	Item Name	Variable	Start Byte	End Byte
18	Name	NM$	1	18
14	Address	AD$	19	32
12	City	CT$	33	44
2	State	ST$	45	46
5	Zip Code	ZC$	47	51

Fig. 1. Form for documenting specifications for random access disk file data.

Address correspondence to Dan Bishop, PO Box 429, Buena Vista, CO 81211.

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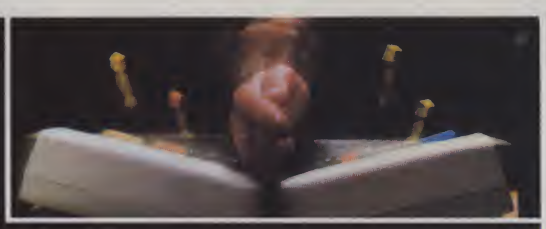
Don't take it out on your hardware. The problem could be your software.



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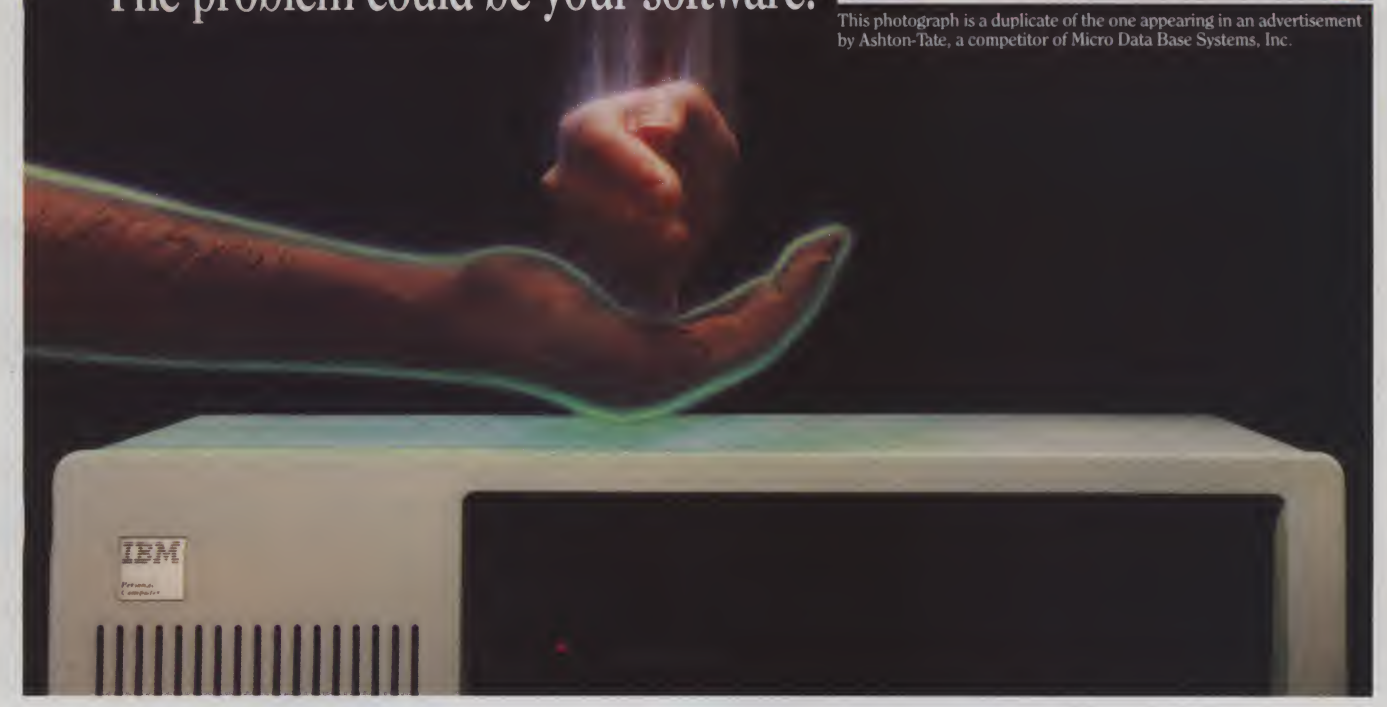

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want to divide the information and use two or more files. For example, an accounts receivable program may use one file for client information (which rarely changes), a second file to contain the client's balance and aging information (for example, a 30-day balance), and a third file to record individual transactions made to that client's account.

Now rearrange the list so that all of the items that you're planning to include in each file are listed together, along with their byte counts. Fig. 1 shows an example of a form that is useful at this stage in the development process. By including variable names as well, this form can also become part of your program documentation.

Next, add up the total number of bytes that each record will require for each file. Beware of the fact that information is stored on disk in 255-byte units and that the most efficient use of your disk space will be obtained if your byte counts for each file are some factor of 255.

You may want to make minor adjustments (where possible) to the byte count for specific items to accommodate this fact. For example, if your mail list file requires 54 bytes per record, you might cut three bytes off the name or address fields to bring the number down to 51 bytes, which would allow you to get five full records into a 255-byte storage unit. (Actually, the 255-byte unit is referred to as a full record, and your 51-byte units are called subrecords).

Good values to use for your subrecord sizes are 127, 85, 63, 51, 42, 36 and 31. These values will maximize use of the disk storage space.

```
RANDOM ACCESS DISK
FILE HANDLER ROUTINES

9400 DEFINT F
9410 READ F
9420 DIM F$(F),FR$(F),FL(F),FR(F)
9430 FOR I=1 TO F
9440      READ F$(I),FL(I)
9490 NEXTI
9495 RETURN


9500 OPEN"R",1,F$(F)
9502 FI=INT(255/FL(F))
9504 FP=INT((FR(F)-1)/FI)+1
9506 FS=FR(F)-FI*(FP-1)-1
9510 FIELD 1,(FL(F)*FS)ASFD$,FL(F)ASFQ$
9520 IF FP)LOF(1) THEN LSETFQ$=STRING$(FL(F),32): PUT1,FP
9530 GET 1,FP: IF FA=0 THEN FR$(F)=FQ$: GOTO9550
9540 LSET FQ$=FR$(F): PUT 1,FP
9550 CLOSE: RETURN
```

Listing 1. Random access handler routines for the TRS-80. Lines 9400–9490 are called at the beginning of the program and read file information from data statements. Lines 9500–9550 are called whenever a subrecord is loaded from or saved to disk.

```
RANDOM ACCESS DISK FILE
HANDLER ROUTINES
FOR THE IBM PC

9400 DEFINT F
9410 READ F
9420 DIM F$(F), FR$(F), FL(F), FR(F)
9430 FOR I = 1 TO F
9440     READ F$(I), FL(F)
9490 NEXT I
9495 RETURN


9500 OPEN "R",1,F$(F),FL(F)
9510 FIELD 1, FL(F) AS FQ$
9520 GET 1, FR(F): IF LEN(FQ$)=0 THEN FQ$=STRING$(FL(F),32): PUT 1, FR(F)
9530 GET 1, FR(F): IF FA=0 THEN FR$(F)=FQ$: GOTO9550
9540 LSET FQ$=FR$(F): PUT 1, FR(F)
9550 CLOSE: RETURN
```

Listing 2. Random access handler routines for the IBM PC. Lines 9400–9490 are called at the beginning of the program and read file information from data statements. Lines 9500–9550 are called whenever a subrecord is loaded from or saved to disk.

Yes, You're Ready

You are now ready to set up the program to use random access files. Lines 9400–9550 (Listing 1 for the TRS-80; Listing 2 for the IBM PC) are copied into the program. If you're using a TRS-80, you must be sure to clear enough string space at the start of the program for the variables you'll be using.

Next, execute a Gosub 9400. Then, start writing the data statements that describe the file system you wish to use. At 9600, enter the number of different files you plan to use. For example, if you plan to use four files, then enter:

```
9600 DATA 4
```

Following this are data statements that specify each file's name and the total number of bytes you wish to assign to each subrecord within that file. For example:

```
9610 DATA "NAMEFILE/DAT",85
9620 DATA "BALANCE/DAT",63
9630 DATA "TRNSACTN/DAT",51
9640 DATA "AGING/DAT",63
```

For the IBM PC, substitute a "." for the "/" in each of the filenames.

You now have all the file manipulation information necessary for the computer to work with random access files. Each of the four files above will be called from the program by a file number, F.

Thus, to use the NAMEFILE/DAT file in the example, simply specify F=1. To use the AGING/DAT file, specify F=4.

Two other variables must be specified. Tell the computer which subrecord you want to work with in the chosen file, using the array variable FR(F) (for example, FR(F)=58). And specify whether you want to retrieve information from the file (FA=0), or if you're planning to place new or revised information into the file (FA=1). If you're adding information, specify what that information is in the form of a string, FR$(F). When these variables have been assigned their appropriate values, execute a Gosub 9500.

Single String of Info

The disk access subroutine at 9500 will read the disk and provide the entire subrecord as a single string of in-

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formation stored in the array variable, FR$(F), where F corresponds to the file from which the information was obtained.

In order to break indivdual data from this string, use the MD$ function (described below) as soon as FR$(F) has been returned by the subroutine at 9500.

Saving information onto disk in a specific file's subrecord is just as simple. If the value for FA is 1, the subroutine at 9500 will expect that you're planning to transfer the string FR$(F) to the subrecord indicated by FR(F).

Before you go to 9500, use the MID$ function to "load" FR$(F) with the appropriate data. The method for doing this is described below. Once this has been done, you can transfer the information in FR$(F) to the appropriate subrecord on the disk by executing a Gosub 9500.

The MID$ Function

In case you haven't encountered the MID$ function before, the IBM PC and Radio Shack's Basic both allow this function to serve different roles. The first use of MID$ allows you to operate on a given string and removes a smaller section out of that string.

If A$="GEORGE WASHINGTON", then MID$(A$,5,8) would be "GE WASHI". Within the parentheses are three items. The first identifies the string on which you are going to operate. The number in the middle tells where the operation is to be performed by specifying the number of the first byte to be removed, counting from the beginning of the string.

The third item tells the computer how many bytes to remove from the string. In this way, you can break FR$(F), which is your entire subrecord returned by the subroutine at 9500, into its individual components. Handling of numeric information packed within the string is described later.

For file-handling purposes, suppose you wish to retrieve subrecord 93 from disk file 1. The following instructions accomplish this task:

```
FA=0: F=1: FR(F)=93: GOSUB 9500
```

The desired subrecord is returned as a single string, FR$(F). If the first 20 bytes correspond to the client's name, you may use

```
NM$ = MID$(FR$(F),1,20)
```

(which assigns the name to NM$) or MID$(FR$(F),1,20) whenever you wish to use the name.

Your choice as to which approach to use depends on how frequently you must refer to the information from within the program. If it must be used frequently, then NM$ is certainly easier to type in and allows the program to operate more efficiently.

Now suppose the next 15 bytes in FR$(F) correspond to the client's address. You can use

```
AD$= MID$(FR$(F),21,15)
```

to remove the address from FR$(F). In this way, each item stored within the subrecord can be broken out and, if desired, assigned to specific variable names.

Out with the Old, In with the New

The second use for the MID$ function allows you to build up a string of information by replacing data current-

In case you haven't encountered the MID$ function before, the IBM PC and Radio Shack's Basic both allow this function to serve different roles.

ly within a string with new data. When MID$ is used in this way, the MID$ function appears to the left of the "=" sign instead of to the right, and the replacement string is on the right.

Again, there are three items within the parentheses. The first identifies the string being operated upon, the second tells where the replacement information is to begin and the third tells how many bytes are to be replaced. Thus, if A$="GEORGE WASHINGTON" and B$="MARTHA", then MID$(A$,1,6)=B$ would change A$ to "MARTHA WASHINGTON".

It is this second use of the MID$ function that allows you to add new or edited information into your random access disk files.

By defining a string to consist of as many blank spaces as there are bytes in your subrecord, and then replacing those blanks with the information belonging to that subrecord, you can build up a string that will contain all of

the information you wish to store to disk. The string FR$(F) is used for this purpose, where F again corresponds to the particular file you are working with.

The statement

FR$(F) = STRING$(85,32)

produces a string containing 85 blank characters (32 is the ASCII code for a blank space). Now, if you have a name, NM$, to place in the first 20 bytes of this string, and an address to occupy the next 15 bytes, use the MID$ function:

MID$(FR$(F),1,20) = NM$

MID$(FR$(F),21,15) = AD$

You can continue in this fashion with each different item you wish to store in the subrecord, ultimately building a string that contains 85 bytes of information.

If you're editing a subrecord, it will be easier to replace only the edited information. In that case, you'll want to keep FR$(F) intact, just as it was retrieved from the disk.

If you're editing a subrecord, it will be easier to replace only the edited information. In that case, you'll want to keep FR$(F) intact, just as it was retrieved from the disk. You'll also want to use the MID$ function to replace only those specific items being changed.

Having defined the string you wish to store in your disk file, you may use the following instruction sequence:

FA=1 : F=1 : FR(F)=93 : GOSUB 9500

Defining FA=1 tells the computer that you wish to store FR$(F) onto disk. F=1 specifies which file you are going to store the information into, and FR(F)=93 tells the computer that the information is to be stored in subrecord number 93. When Gosub 9500 is executed, the file is opened and properly fielded, FR$(F) is placed into subrecord 93 and the file is closed.

Numeric Data

Numeric information is usually stored on disk in packed form; this al-

Listing 3. Appointments Datebook program using the random access handler routines. TRS-80 (models I and III) listing.

```
DATEBOOK   PROGRAM

USING RANDOM ACCESS HANDLER ROUTINES


10 CLEAR 2000
20 GOSUB9400
30 DIM A$(6),A(6),D$(7)
40 FOR I=1 TO 7
50     READ D$(I)
60 NEXT I
70 CLS
80 INPUT"WHICH MONTH (1-12) OR 0?";F
90 IF F=0 THEN END
100 IF (F(1 OR F)12) THEN 70
110 INPUT"WHICH DAY (1-31)?";FR(F)
120 IF (FR(F)(1 OR FR(F))31) THEN 110
130 FA=0: GOSUB9500
140 GOSUB2000
150 CLS
160 PRINT"MONTH:  "LEFT$(F$(F),3)"    DAY:   "FR(F)
170 PRINTTAB(23)D$(D): PRINT
180 FORI=1TO6
190    PRINTI;
200    IF (A(I)(.01 OR A(I))25) THEN PRINT: GOTO220
210    PRINTUSING":  ##.##";A(I);:PRINT" ...  "RIGHT$(A$(I),17)
220 NEXTI
230 PRINT"ENTER NUMBER OF ITEM TO CORRECT OR ADD TO."
240 PRINT"      (ENTER 0 TO QUIT;  7 TO CHANGE DAY.)"
250 Z$=INKEY$: IF Z$="" THEN 250
260 Z=VAL(Z$)
270 IF Z=0 THEN 370
280 IF (Z(1 OR Z)7) THEN 150
290 IF Z=7 THEN GOSUB 2200: GOTO 360
300 PRINT"NEW ITEM:   TIME...  (USE 24 HR CLOCK; ENTER AS DECIMAL: 15.45)"
310 PRINT"                =)  ";: LINEINPUT A$: A(Z)=VAL(A$)
320 PRINT"            DESCR..  ----------------"
330 PRINT"                =)  ";: LINEINPUTAA$
340 A$(Z)=LEFT$(MKS$(A(Z))+AA$+STRING$(21,32),21)
350 GOSUB 2100
360 GOTO 150
370 FR$(F)=""
380 FOR I=1 TO 6
390    FR$(F)=FR$(F)+A$(I)
400 NEXTI
410 FR$(F)=FR$(F)+RIGHT$(STR$(D),1)
420 FA=1: GOSUB9500
430 GOTO 70


2000 FOR I=1 TO 6
2010     A$(I)=MID$(FR$(F),21*I-20,21)
2020     A(I)=CVS(MID$(A$(I),1,4))
2030 NEXTI
2040 D=VAL(RIGHT$(FR$(F),1))
2050 GOSUB2100
2060 RETURN
2100 FOR I=1 TO 5
2110     IF (A(I)(.01 OR A(I))25) THEN A(I)=99
2120     FOR J=I+1 TO 6
2130         IF (A(J)(.01ORA(J))25) THEN A(J)=99
2140         IF A(J))=A(I) THEN 2170
2150         A$=A$(I): A$(I)=A$(J): A$(J)=A$
2160         A=A(I): A(I)=A(J): A(J)=A
2170     NEXTJ
2180 NEXTI
2190 RETURN


2200 PRINT"ENTER # FOR DAY OF WEEK  (1-7 FOR SUNDAY-SATURDAY)"
2210 D$=INKEY$: IF D$="" THEN 2210 ELSE D=VAL(D$)
2220 IF (D(1 OR D)7) THEN 2200
2230 RETURN


9400 DEFINT F
9410 READ F
9420 DIM F$(F),FR$(F),FL(F),FR(F)
9430 FOR I=1 TO F
9440     READ F$(I),FL(I)
9490 NEXTI
9495 RETURN


9500 OPEN"R",1,F$(F)
9502 FI=INT(255/FL(F))
9504 FP=INT((FR(F)-1)/FI)+1
9506 FS=FR(F)-FI*(FP-1)-1
9510 FIELD 1,(FL(F)*FS)ASFD$,FL(F)ASFQ$
9520 IF FP)LOF(1) THEN LSETFQ$=STRING$(FL(F),32): PUT1,FP
9530 GET 1,FP: IF FA=0 THEN FR$(F)=FQ$: GOTO9550
9540 LSET FQ$=FR$(F): PUT 1,FP
9550 CLOSE: RETURN
```

More

Listing 3 continued.

```
9600 DATA 12
9610 DATA "JAN/DAT",127
9620 DATA "FEB/DAT",127
9630 DATA "MAR/DAT",127
9640 DATA "APR/DAT",127
9650 DATA "MAY/DAT",127
9660 DATA "JUN/DAT",127
9670 DATA "JUL/DAT",127
9680 DATA "AUG/DAT",127
9690 DATA "SEP/DAT",127
9700 DATA "OCT/DAT",127
9710 DATA "NOV/DAT",127
9720 DATA "DEC/DAT",127
9730 DATA SUNDAY, MONDAY, TUESDAY, WEDNESDAY
9740 DATA THURSDAY, FRIDAY, SATURDAY
```

lows more information to be stored within a given amount of disk space. Numbers that are integers are converted to two-byte strings, numbers that are single-precision are converted to four-byte strings, and numbers that are double-precision are converted to eight-byte strings. To do this, the functions MKI$, MKS$ and MKD$ are used. These functions can be used with the MID$ function described above.

Thus, if you have two numbers to place into your FR$(F) string for storage to disk, and the first is an integer,

Listing 4. Appointments Datebook program using the random access handler routines. IBM PC listing. Be sure to load BasicA using the following format: BasicA/S:251.

```
YOU MUST GO FROM DOS TO BASICA USING
    BASICA/S:251
20 GOSUB 9400
30 DIM A$(10),A(10),D$(7)
40 FOR I=1 TO 7
50  READ D$(I)
60 NEXT I
70 CLS
80 INPUT "WHICH MONTH (1 TO 12) OR 0 TO END?"; F
90 IF F=0 THEN END
100 IF (F<1 OR F>12) THEN 70
110  INPUT "WHICH DAY (1 TO 31)?"; FR(F)
120 IF (FR(F)<1 OR FR(F)>31) THEN 110
130 FA=0: GOSUB 9500
140 GOSUB 2000
150 CLS
160 PRINT "MONTH:    " MID$(F$(F),3,3)"     DAY:     "FR(F)
170 PRINT TAB(23)"DAY..."D$(D): PRINT
180 FOR I=1 TO 10
190   PRINT I-1;
200    IF (A(I)<.01 OR A(I)>25) THEN PRINT: GOTO 220
210   PRINT USING ":  ##.##";A(I);:PRINT"...  "RIGHT$(A$(I),21)
220 NEXT I
230 PRINT "ENTER NUMBER OF ITEM TO CORRECT OR ADD TO."
240 PRINT"      (ENTER X TO QUIT;  D TO CHANGE DAY.)"
250 Z$=INKEY$: IF Z$="" THEN 250
260 Z=VAL(Z$)
270 IF Z$="X" THEN 370
275 IF Z$="D" THEN GOSUB 2200: GOTO 360
280 IF (Z<0 OR Z>9) THEN 150
290 IF (Z=0 AND Z$<>"0") THEN 150
300 PRINT "NEW ITEM:   TIME...  (USE 24 HR CLOCK; ENTER AS DECIMAL: 15.45)"
310 PRINT "                 =>  ";: LINE INPUT A$: A(Z+1)=VAL(A$)
320 PRINT "             DESCR..  ----------------------"
330 PRINT "                 =>  ";: LINE INPUT AA$
340 A$(Z+1)=LEFT$(MKS$(A(Z+1))+AA$+STRING$(25,32),25)
350 GOSUB 2100
360 GOTO 150
370 FR$(F)=""
380 FOR I=1 TO 10
390   FR$(F)=FR$(F)+A$(I)
400 NEXT I
410 FR$(F)=FR$(F)+RIGHT$(STR$(D),1)
420 FA=1: GOSUB 9500
430 GOTO 70
2000 FOR I=1 TO 10
2010   A$(I)=MID$(FR$(F),25*I-24,25)
2020   A(I)=CVS(MID$(A$(I),1,4))
2030 NEXT I
2040 D=VAL(RIGHT$(FR$(F),1))
2050 GOSUB 2100
2060 RETURN
2100 FOR I=1 TO 9
2110    IF (A(I)<.01 OR A(I)>25) THEN A(I)=99
2120   FOR J=I+1 TO 10
2130    IF (A(J)<.01 OR A(J)>25) THEN A(J)=99
2140    IF A(J)>A(I) THEN 2170
2150    A$=A$(I): A$(I)=A$(J): A$(J)=A$
2160    A=A(I): A(I)=A(J): A(J)=A
2170   NEXT J
2180 NEXT I
2190 RETURN
2200 PRINT "ENTER # FOR DAY OF WEEK (1-7 FOR SUNDAY-SATURDAY)"
2210 D$=INKEY$: IF D$="" THEN 2210 ELSE D=VAL(D$)
2220 IF (D<1 OR D>7) THEN 2200
2230 RETURN
9400 DEFINT F
9410 READ F
9420 DIM F$(F), FR$(F), FL(F), FR(F)
9430 FOR I=1 TO F
```

More

In order to see how the program works, fill information into several dates, remembering the dates as you go along. Then call up the dates again to verify that the information originally entered indeed has been stored to disk.

II%, while the second is a double-precision number represented by AM#, then the following instructions should be used (assuming the rest of FR$(F) is ready to be saved to disk):

```
MID$(FR$(F),42,2) = MKI$(II%)
MID$(FR$(F),44,8) = MKD$(AM#)
FA = 1: F = 1: FR(F) = 29: GOSUB 9500
```

Note that the byte count used in the MID$ function is 2 for the integer and 8 for the double-precision value. This will always be the case.

A similar situation is encountered when information is retrieved from disk. Numbers that have been saved in packed form must be converted from the packed strings to numeric before they can be used. For this purpose, three functions, CVI, CVS and CVD, have been provided.

Suppose FR$(F) is to be retrieved from subrecord 29 of file 1, and that the last ten bytes of FR$(F) contain an integer and a double-precision value stored in packed form. The following instructions will retrieve the appropriate subrecord and convert the numbers into numeric data:

FA=0: F=1: FR(F)=29: GOSUB 9500
II%=CVI(MID$(FR$(F),42,2))
AM#=CVD(MID$(FR$(F),44,8))

Notice the similarity between the MID$ functions used to place data into the FR$(F) string and the MID$ functions used to retrieve information from the FR$(F) string. When setting up the subroutines to load information into FR$(F) and to retrieve information from FR$(F), follow the mirror-image symmetry that relates the two sets of instructions.

Sample Program Using Random Access Disk Files

Listing 3 provides a simple but useful program for the TRS-80; it serves as an example for using the random access subroutines presented in Listing 1. (Listing 4 provides the same program, modified for use with the IBM PC.)

Listing 3 uses random access disk storage to set up a 366-day appointment datebook. Lines 9400–9550 are exactly the same as the lines in Listing 1, and will remain the same in all programs you write that use this technique.

The program uses 12 random access disk files (refer to the data statements in lines 9600–9640)—one for each month. Each file will contain 127-byte subrecords that have three data fields. These subrecords represent the individual days within the month.

When running the program, you'll be prompted to enter first a number from 1–12 to specify which file (month) you want to work with, then a number for the date that specifies the subrecord number to be accessed. The display then will show the individual data items currently read from the disk for that subrecord. (This will be blank information to begin with until you actually have saved data onto the disk.) You may either keep the current information by pressing the zero key, or change the information by pressing a numeral key between 1 and 7 and typing in the new data to correspond to that item number.

The new data subsequently will be displayed in that field and you'll be allowed to make additional changes to that subrecord. The computer stores the new information onto disk in the appropriate file and subrecord as soon as the zero key is pressed; it prompts you again for a new month and day to work with. To end the program, enter a zero for the month.

In order to see how the program works, fill information into several dates, remembering the dates as you go along. Then call up the dates again to verify that the information originally entered indeed has been stored to disk.

Alternatively, you may wish to return to DOS mode and list each of the data files (do not use quotation marks around the file names in DOS mode). You'll be able to see each of the subrecords as they were entered (except for the weird symbols used to represent the packed numbers), and you'll see garbage still on the disk for unused subrecords. Once you've entered data onto the disk, you may wish to call up a date you previously entered and change some of the data in that date. Then verify that the edited information has been saved to disk.

The IBM PC version is set up in much the same fashion. Since double-density disks are standard with the IBM, more storage space is available, making it possible to use 21 bytes for each appointment description instead of 17, and to allow up to ten appointments to be entered for each date.

Listing 4 continued.

```
9440   READ F$(I)
9490 NEXT I
9495 RETURN
9500 OPEN "R",1,F$(F),251
9510 FIELD 1, 251 AS FQ$
9520 GET 1,FR(F): IF LEN(FQ$)=0 THEN FQ$=STRING$(251,32): PUT 1, FR(F)
9530 GET 1,FR(F): IF FA=0 THEN FR$(F)=FQ$: GOTO 9550
9540 LSET FQ$=FR$(F): PUT 1, FR(F)
9550 CLOSE: RETURN
9600 DATA 12
9610 DATA "B:JAN.DAT"
9620 DATA "B:FEB.DAT"
9630 DATA "B:MAR.DAT"
9640 DATA "B:APR.DAT"
9650 DATA "B:MAY.DAT"
9660 DATA "B:JUN.DAT"
9670 DATA "B:JUL.DAT"
9680 DATA "B:AUG.DAT"
9690 DATA "B:SEP.DAT"
9700 DATA "B:OCT.DAT"
9710 DATA "B:NOV.DAT"
9720 DATA "B:DEC.DAT"
9730 DATA SUNDAY, MONDAY, TUESDAY, WEDNESDAY
9740 DATA THURSDAY, FRIDAY, SATURDAY
```

Should a system crash occur with a disk file open (or should someone accidentally remove a disk while a file is open), you could lose an entire file. With the technique presented in this article, a file is opened, read, written to and closed in one rapid operation...

Technical Information

Lines 9400–9495 handle the initial reading of the data statements into the program. The number of files you are using is denoted by F. This is the first data element to be read by the computer, and the value of F is used to dimension the variables used by the random access handling routine.

When the 9500–9550 routine is called from within the program, the value of F must be specified to determine the subscript value for the array variables. A value of 1 for F specifies that the file being called will be the first file listed in the data lists; F=2 calls the second file listed, and so on. (In this program, each file represents a month, so the value of F is input into the program when the user specifies the month he wishes to work with.)

The 9400–9495 subroutine then sets up a loop that reads each file name in succession, along with the number of bytes per subrecord for that file. The file names are stored as F$(F) and the byte counts are stored as FL(F).

Lines 9500–9550 handle the I/O for random access disk files. Since each call to 9500 both opens and closes the file, there is no need to worry about more than one buffer or channel.

Although disk Basic allows several buffers to be active at once, it is questionable as to whether this practice is a particularly good one; a disk file should be left open for only the shortest possible time.

Should a system crash occur with a disk file open (or should someone accidentally remove a disk while a file is open), you could lose an entire file. With the technique presented in this article, a file is opened, read, written to and closed in one rapid operation;

thus, only one buffer field need be specified by the program. The data elements are transferred out of the buffer field FQ$ and into FR$(F) before a return is made to the main program.

Calculations

Lines 9502–9506 use the byte count, FL(F), to calculate FI, the number of subrecords allowed per 255-byte disk record. Then, using the value of FR(F), the subrecord number, which was specified by the program before subroutine 9500 was called, the actual disk record that contains this subrecord is calculated (FP).

Finally, the subrecord location within the record (counting from zero) is calculated and saved under FS. With FS and FL(F), you next field the buffer in line 9510 and associate FD$ with the preceding subrecords, in which you have no interest, and FQ$ with the desired subrecord. These manipulations are not necessary with the IBM PC; FR(F) may be used directly with get and put statements.

Now you must get the physical record, FP, from the disk. If you attempt to get a record, test to be sure the record exists in line 9520. If it does not, simply put a dummy record there. In line 9530 you get the record. In order to preserve the information in the desired subrecord should you make subsequent subroutine calls for different files, set FR$(F) equal to FQ$. Next, close the file and return if the value of FA is zero. You must specify in the program, prior to the subroutine call, whether FA is to be 0 or 1.

If all you wish to do is retrieve a record, then FA=0 (see line 130). If you wish to put a record onto disk, then specify FA=1 (refer to line 420). The instructions in line 9540 are carried out only if FA<>0. These instructions set FQ$ equal to FR$(F), and put FQ$ into disk record FP. Recall that you must build the FR$(F) string in the main program before doing the Gosub 9500 call. In the sample program, this process is done in lines 370–410.

The subroutine at lines 2000–2060 takes FR$(F), which has just been retrieved from disk, and breaks it down into the individual data elements. As set up, each subrecord consists of six appointments, in which the first four bytes correspond to the appointment time (in packed, single-precision form), and the next 17 bytes correspond to the description.

Since the appointment time is treated as a decimal number, times should be entered using a decimal point rather than the more common colon. Thus, 9:45 a.m. is entered as 9.45, and 3:30 p.m. as 15.30.

The last byte in each subrecord is a one-byte string between 1 and 7 that corresponds to the day of the week for that particular date. When unpacked, A(I) contains the appointment time, A$(I) contains the description and D specifies the day.

The subroutine at lines 2100–2190 corresponds to a simple bubble sort for the individual appointments entered for a given date. The sort is carried out according to the appointment times, so a 24-hour clock must be used to list them in correct order.

Incidentally, any nonappointment entries, such as birthdays or anniversaries, still must be given a time in order for them to appear on the calendar. Both 25.00 and 0.01 will serve this purpose.

An added advantage is that a simple program can be written to make disk I/O routines and variables self-documenting. Next month, I'll describe these further enhancements of random access disk I/O.

This program will allow 366 days to be set up on a single-density disk that contains both Basic and the Datebook program. It does limit the number of entries per day to six, and limits the description for each appointment to 17 characters.

A double-density disk could allow each date to use a full 255-byte record. This would allow more entries per date, or longer descriptions, or both.

The handler routines would be unaffected by this change; only the byte counts in the data statements would be altered.

Program Dimensions

Within the program itself, the dimension statement at line 30 would have to be changed, and the For... Next limits at lines 180, 380, 2000, 2100 and 2120 would need changing. If the string length for appointment descriptions is lengthened, then the string function limits in lines 210, 320, 340 and 2010 must be changed.

It is important, however, to keep the first four bytes in each appointment entry reserved for the appointment time, and to keep the last byte in your date subrecord reserved for the day-of-the-week indicator.

Finally, the values allowed for Z in lines 240, 280 and 290 must be revised to allow for a larger number of entries. These changes are shown in the IBM PC program in Listing 4.

One further alteration will allow an additional two bytes for each appointment description. The appointment times (entered as decimal numbers) become integers and, if multiplied by 100, can be saved to disk in only two bytes instead of four, using the MKI$ function. When retrieving the data from the disk, the CVI function can be used in line 2020, and A(I) can be divided by 100 to restore it to its originally entered value.

This program is unusual in that all 12 data files have the same format. When the files are formatted to handle different types of information, the routines that extract individual data items from FR$(F), and that build up FR$(F) prior to saving the subrecord to disk, can be called using ON F Gosub, sending the program to different subroutines based on the specific value of F in use at that time.

This instruction would appear just after Gosub 9500 when information is being retrieved from disk, and just before Gosub 9500 when information is being prepared to be stored to disk. In this way, each file would have its own unique packing and unpacking subroutines for FR$(F).

Conclusion

As is evident from the above example, with the random access handler routine presented in this article a great variety of random access files can be manipulated with little concern about the actual I/O instructions involved. It turns out that with careful use of arrays, even the MID$ functions described in this article can be simplified into "cookbook" routines so we needn't worry about them.

An added advantage to this further step is that a simple program can be written to make disk I/O routines and variables self-documenting. Next month, I'll describe these further enhancements of random access disk I/O. You may find that your approach to disk files will never be the same! ■

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Manufacturer Name/Address	Model	Dimensions (in inches)	Weight	Price	Micro-processor	Bit Configuration
Access Matrix Corp. 1259 Bering Drive San Jose, CA 95131	Access	16.5×10×10.8	33 lbs.	$2495	Z-80A	8-bit
Apple Computer, Inc. 20525 Mariani Ave. Cupertino, CA 95014	Apple II Plus	4.5×15.5	11 lbs.	1330	6502	8-bit
	Apple IIe	4.5×15.13×18	12 lbs.	1395	6502A	8-bit
Billings Computer Corp. 18600 E. 37th Terrace S. Independence, MO 64057	Series 6000	16×20	45 lbs.	2025	Z-80A	8-bit
Colonial Data 105 Sanford St. Hamden, CT 06514	SB-80, SB-80/4	22×19	39 lbs.	1600	Z-80	8-bit
Commodore Business Machines 1200 Wilson Drive West Chester, PA 19380	CBM 9000 Superpet	24×21×19	53 lbs.	1995	6502/6809	8-bit
	CBM 8032	24×20×20	48 lbs.	1495	6502	8-bit
	PET 4032	24×21×20	47 lbs.	1295	6502	8-bit
Compal 8500 Wilshire Blvd. Beverly Hills, CA 90211	Electric Briefcase	9×20×15	26 lbs.	1995	Z-80A	8-bit
Corona 31324 Via Colinas Westlake Village, CA 91361	Corona Portable	8×20×20	28 lbs.	2395	8088	16-bit

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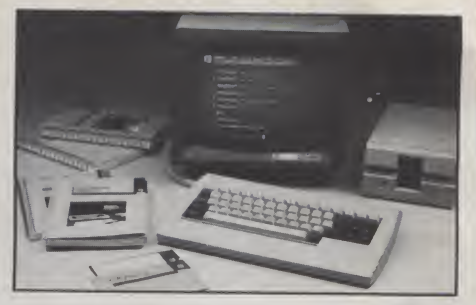
48–64K RAM 12K ROM	143K	5¼"	Apple DOS	N/A	80×40	N	RS-232-opt; Parallel-opt.
64–128K RAM 16K ROM	140K	5¼"	Apple DOS	N/A	80×40	N	RS-232-opt; Parallel-opt.
64–576K RAM	720K	5¼"	Proprietary	5¼" or 8"	80×24	Y	Parallel; RS-232-opt.
64–320K RAM	2.4M	8"	CP/M 2.2	80M	80×24	N	RS-232; Parallel
96K RAM	175–1000K	5¼"	Proprietary	5–7.5M	80×25	N	RS-232; Parallel-opt.
32K RAM 16K ROM	175–1000K	5¼"	Proprietary	5–7.5M	80×25	N	RS-232; Parallel-opt.
32K RAM 16K ROM	175–1000K	5¼"	Proprietary	5–7.5M	40×25	N	RS-232; Parallel-opt.
64K RAM 4K ROM	400K	5¼"	CP/M	10M 5¼"	80×24	N	RS-232; Parallel
128–512K RAM	320K	5¼"	MS-DOS	10M	9" built-in monitor	N	RS-232; Parallel

N/A = Not available



Manufacturer Name/Address	Model	Dimensions (in inches)	Weight	Price	Micro-processor	Bit Configuration
Cromemco, Inc. 280 Bernardo Ave. Mt. View, CA 94039	C-10SP Personal Computer	Keyboard—2×13.88×7.8 CPU—3.38×5.78×8	25.5 lbs.	1785	Z-80A	8-bit
Eagle Computer, Inc. 983 University Ave. Los Gatos, CA 95030	IIE Series	18×21×13.5	49 lbs.	1595	Z-80A	8-bit
	PC Series	Keyboard—19×1.7×8.7 CPU—20.5×5.7×13	25 lbs.	1995	8088	16-bit
ECS Microsystems 215 Devon Drive San Jose, CA 95112	ECS Work Station	11.44×20×17.13	37.5 lbs.	2450	Z-80A	8-bit
Epic Computer Products 18381 Bandilier Circle Fountain Valley, CA 92708	Episode 2296	7.5×9.5×14.5	17 lbs.	2100	Z-80A	8-bit
Epson 3415 Kashiwa St. Torrance, CA 90505	QX-10	Keyboard—20×8.9×1.9 CPU—20.3×13.6×4.1	38.2 lbs.	2495	Z-80A	8-bit
Franklin Computer Corp. 7030 Colonial Way Pennsauken, NJ 08109	ACE 1000	17.75×4.5×19.75	15 lbs.	1530	6502	8-bit
	ACE 1200	17.75×8×19.75	22.25 lbs.	2495	6502	8-bit
Heath Co. Benton Harbor, MI 49022	H89	13×17×20	50 lbs.	1399	Z-80	8-bit
Hewlett-Packard 1820 Embarcadero Road Palo Alto, CA 94303	Model 87XM	7.7×16.5×17.8	21.5 lbs.	1795	NMOS	8-bit
IBM Information Systems Boca Raton, FL 33432	IBM PC	19×15×4	27 lbs.	1595	8088	16-bit
Intertec Data Systems 2300 Broad River Road Columbia, SC 29210	Superbrain	14.63×21.38×23.13	45 lbs.	2495	Z-80A	8-bit
	CompuStar	14.63×21.38×23.13	45 lbs.	1995	Z-80A	8-bit
ITSC 2 Kingston Road Staines, Middlesex TW18 4PA England	Zita	20.4×17.4×8.2	29 lbs.	1800	Z-80A	8-bit

←*Pictured from left to right are the Kaypro, the Epson QX-10 and Cromemco's C10SP.*

Hewlett-Packard's 87XM (left) and the Franklin ACE 1200.→

Memory Capacity	Disk Drive Capacity	Size	Operating System	Hard Disk	Screen Display	Color	Interface
64K RAM 24K ROM	390K	5¼"	CDOS	N/A	80×25	N	RS-232; Parallel
64K RAM 4K EPROM	390–780K	5¼"	CP/M-80	10–32M 5¼"	80×25	N	RS-232; Parallel
64–512K RAM 8K ROM	320K	5¼"	MS-DOS, CP/M-86	10–32M 5¼"	80×25	Y	RS-232; Parallel
16–208K RAM 12K ROM	1000K	5¼"	CP/M	5¼" 1M	80×25	N	RS-232; Parallel-opt.
64K RAM	1.6M	5¼"	CP/M	N/A	N/A	N	RS-232; Parallel
64–256K RAM 2–8K ROM	320K	5¼"	CP/M, TP/M	N/A	80×24	N	RS-232; Parallel
64K RAM 12K ROM	143K each drive	5¼"	Apple DOS 3.3 or 3.2	Available	40×24	N	RS-232-opt.
64K RAM 12K ROM	143K each drive	5¼"	Apple DOS 3.3 or 3.2	Available	40×24	Y	RS-232; Parallel
48–64K RAM 8K ROM	100K	5¼"	CP/M	10M	80×24	N/A	N/A
128–640K RAM 48–96K ROM	270K–1.1M	5¼"	CP/M	5M	80×24	N/A	N/A
16–256K RAM 40K ROM	360K	5¼"	MS-DOS, CP/M-86 UCSD p-System	5–10M	80×25	Y	RS-232
64K RAM	Up to 1.5M	5¼"	CP/M	8"	80×24	N	RS-232
64K RAM	350K–1.5M	5¼"	CP/M	8"	80×24	N	RS-232
64–512K RAM 5K ROM	125K	5¼"	CP/M	5–12M	80×25	N	RS-232; Parallel-opt.

N/A = Not available

Manufacturer Name/Address	Model	Dimensions (in inches)	Weight	Price	Micro-processor	Bit Configuration
Jonos, Ltd. 920-C E. Orangethorpe Anaheim, CA 92801	C1100	7.25×17.25×13.25	25 lbs.	1995	Z-80A	8-bit; 16-bit opt.
	Escort	7.25×17.25×13.25	25 lbs.	2495	Z-80A	8-bit
LNW Computers 2620 Walnut Tustin, CA 92680	80 II	3.5×16.5	26 lbs.	1995	Z-80A	8-bit
Magic Computer Co., Inc. Two Executive Drive Fort Lee, NJ 07024	PBC-88/2	6.25×19×15	23 lbs.	2295	Z-80A/6502	2×8-bit
Modular Computer Systems 1650 W. McNab Road Ft. Lauderdale, FL 33310	Zorba	9×17.5×16	22 lbs.	1995	Z-80A/8088	8-bit
Morrow Designs, Inc. 600 McCormick St. San Leandro, CA 94577	Micro Decision	5.2×6.7	14.2 lbs.	1195	Z-80A	8-bit
Multitech Electronics, Inc. 195 West El Camino Real Sunnyvale, CA 94086	MIC-500	15.3×6×5.3	15.4 lbs.	1395	Z-80A	8-bit
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Osborne Computer Corp. 26538 Danti Court Hayward, CA 94545	Osborne I	8.5×20.5×14.5	26.2 lbs.	1795	Z-80A	8-bit
Personal Microcomputers 475 Ellis St. Mountain View, CA 94043	PMC-101 Micro Mate	3.5×6×15	8.5 lbs.	1095	Z-80	8-bit
Quay Corp. 22 Meridian Road, Box 783 Eatontown, NJ 07724	#500	6.8×16.2×18.1	40 lbs.	1995	Z-80A	8-bit
	#520	6.8×16.2×18.1	40 lbs.	2395	Z-80A	8-bit
Sanyo Business Systems 51 Joseph St. Moonachie, NJ 07074	MBC 1000	16.13×12.63×14	50 lbs.	1995	Z-80A	8-bit
	MBC 1200/1250	16×13.14×14.43	50 lbs.	2495	Z-80A	8-bit
Seequa Computer Corp. 209 West St. Annapolis, MD 21401	Chameleon	8×18×15	28 lbs.	1995	8088/Z-80A	8/16-bit
Sharp Electronics Corp. 10 Sharp Plaza Paramus, NJ 07652	Sharp PC-5000	12.75×12×3.5	11 lbs.	2495	8088	16-bit
SKS Computers, Inc. 4091 Leap Road Hilliard, OH 43026	SKS 2502 NANO	15.63×10.13×6.5	26 lbs	2495	Z-80A	8-bit; 16-bit opt.

Memory Capacity	Disk Drive Capacity	Size	Operating System	Hard Disk	Screen Display	Color	Interface
64–128K RAM 2–8K ROM	1M	5¼"	CP/M Plus	5M 3.9" cartridge	80×25	N	RS-232; Parallel-opt.
64K RAM 8K ROM	322K	2½"	CP/M	5M 3.9"	80×25	N	RS-232; Parallel-opt.
96K RAM 12K ROM	3.55M	5¼" or 8"	DOS Plus 3.4 CP/M 2.2	80M 5¼"	80×24	Y	RS-232; Parallel
64K RAM 7K ROM	400K	5¼"	CP/M 2.2	10M 5¼"	80×24	N	RS-232; Parallel
64–320K RAM 16K ROM	400–800K	5¼"	CP/M	N/A	80×25	N	RS-232; Parallel-opt.
64K RAM 2K EPROM	400K	5¼"	CP/M 2.2	N/A	80×25	N	RS-232
64K RAM 4K ROM	400K	5¼"	CP/M	N/A	80×40	Y	RS-232; Parallel
64K RAM 4K ROM	195K	5¼"	CP/M	N/A	80×24	N	RS-232; Parallel
64K RAM 4K ROM	204K	5¼"	CP/M	N/A	52×24	N	RS-232; Parallel
128K RAM 4K ROM	400K	5¼"	CP/M Plus	Available 4th Qtr. 10M	80×24	N	RS-232; Parallel
64–128K RAM 32K ROM	200K	5¼"	CP/M or MP/M	5–20M 5¼"	80×24	N	RS-232; Parallel
64–128K RAM 32K ROM	400K each drive	5¼"	CP/M or MP/M	5–20M 8"	80×24	N	RS-232; Parallel
64K RAM 4K ROM	327K	5¼"	CP/M	5–20M	80×25	N	RS-232; Parallel
64K RAM 4K ROM	640K	5¼"	CP/M	5–20M	80×40	N	RS-232; Parallel
128–256K RAM 48K ROM	Dual 160K	5¼"	MS-DOS; CP/M-86; CP/M-80	10M	80×25	Y	RS-232; Parallel
128–256K RAM 192K ROM	640K	5¼"	MS-DOS	N/A	80×8 LCD	N	RS-232
80–256K RAM 2K ROM	400K	5¼"	CP/M	5M 5¼"	80×24	N	RS-232; Parallel-opt.

N/A = Not available

Manufacturer Name/Address	Model	Dimensions (in inches)	Weight	Price	Micro-processor	Bit Configuration
Sony Corp. of America Sony Drive Park Ridge, NJ 07656	SMC-70	N/A	N/A	1470	Z-80A	8/16-bit
STM Corp. 525 Middlefield Road Menlo Park, CA 94025	Pied Piper	4×20.2×10.8	4.5 lbs.	1299	Z-80A	8-bit
Televideo Systems 1170 Morse Ave. Sunnyvale, CA 94086	TS-800A	14.25×16.5×14	34.5 lbs.	1395	Z-80A	8-bit
	TS-803	14.5×18.5×14	65 lbs.	2495	Z-80A	8-bit
Texas Instruments PO Box 402430 Dallas, TX 75240	TI Professional Computer	Keyboard—20×7.9×1.4 CPU—18.9×15.5×5	34 lbs.	2195	8088	16-bit
Toshiba America, Inc. 2441 Michelle Drive Tustin, CA 92680	T-100 Portable	21×13×5	24 lbs.	1590	Z-80A	8-bit
	T100 PC	16.5×4×11	N/A	1995	Z-80A	8-bit
	T300	Keyboard—19.7×1.6×9.3 CPU—16.5×5.5×16.5	N/A	2495	8088	16-bit
Zenith Data Systems 450 Milwaukee Ave. Glenview, IL 60025	Z-89	13×17	50 lbs.	1999	Z-80	8-bit
	Z-90	13×17	50 lbs.	2499	Z-80	8-bit

Memory Capacity	Disk Drive Capacity	Size	Operating System	Hard Disk	Screen Display	Color	Interface
64–768K RAM 32K ROM	280K	3½"	CP/M	Available	320 × 200	Y	RS-232
64–256K RAM 4K ROM	256K	5¼"	CP/M	5–10M	2 Line LCD Display	N	Parallel; RS-232-opt.
64K RAM 4K EPROM	N/A	N/A	CP/M	N/A	80 × 24	N	RS-232
64–128K RAM 8K EPROM	500K	5¼"	CP/M	N/A	80 × 24	N	RS-232
64–256K RAM 8–16K ROM	320K	5¼"	MS-DOS; CP/M-86; Concurrent CP/M-86; UCSD p-System	5–10M 5¼"	80 × 25	Y	RS-232-opt.
64K RAM 32K ROM	280K	5¼"	CP/M	N/A	40-column LCD	N	RS-232; Parallel-opt.
64K RAM 32K ROM	280K	5¼"	CP/M	N/A	80 × 25	Y	RS-232; Parallel
192–512K RAM 4K ROM	640K	5¼"	MS-DOS, CP/M-86, opt.	N/A	640 × 400	Y	RS-232; Parallel
48–64K RAM 4K ROM	11M	5¼"	HDOS; CP/M	11M 8"	80 × 24	N	RS-232; Parallel-opt.
64K RAM 4K ROM	11M	8"	HDOS; CP/M	11M 8"	80 × 25	N	RS-232; Parallel-opt.

N/A = Not available

Micro Software Digest

Compiled by Swain Pratt

Micro Software Digest presents capsulized software reviews from various computer-related publications.

Ozmosis

System Requirements: Osborne and another CP/M-based computer; CP/M; 64K RAM; two disk drives
Manufacturer: Acquis Data, Inc., 17192 Gillette, Irvine, CA 92714
Price: $150
Comments: "Ozmosis," says the review, "is a data-communications program designed to transfer files to or from an Osborne 1 computer and a standard CP/M computer."

A user familiar with CP/M should have no trouble getting the program to run, states the review, concluding that "Ozmosis will do the job it is intended for. It is easy to use, once installed. It is, however, slow compared to other programs that do the same task." Reader Service number 401

(Reviewed in InfoWorld, *April 11, 1983)*

$PLOT

System Requirements: IBM PC; PC-DOS and disk Basic; 64K RAM; one disk drive; unmodified Epson (or IBM) MX-80 printer
Manufacturer: Redox Software, PO Box 8, Yorktown Heights, NY 10598
Price: $14.95
Comments: $PLOT, according to the review, "is a collection of well-written, low-resolution graphics programs. . . intended for [a programmer's] use with other software or incorporation into other programs."

The review cautions that the user should be familiar with the IBM PC and possess moderate programming knowledge to employ the program. The documentation is good, and, concludes the review, "For the $14.95 price, this package is astonishingly underpriced." Reader Service number 402

(Reviewed in InfoWorld, *April 4, 1983)*

Taxmode

System Requirements: Apple II Plus or Apple III with emulator; DOS 3.3; 48K RAM; 5¼-inch floppy disk drive
Manufacturer: Sawhney Software, 888 7th Ave., New York, NY 10106
Price: $250
Comments: Taxmode, states the review, "is a professional tax-planning program, and you must be familiar with federal tax law to use it effectively." The innovative screen layout makes for exceptionally efficient and easy use, according to the review.

The manual is "readable and easy to follow," says the review, and "provides a good primer for tax planners who are new to computers." Once you have reviewed the manual and booted the disk, "you merely follow the on-screen instructions," says the review. Reader Service number 403

(Reviewed in InfoWorld, *March 21, 1983)*

The Word Plus

System Requirements: IBM PC; DOS 2.0; 64K RAM; preferably two disk drives
Manufacturer: Oasis Systems, 2765 Reynard Way, San Diego, CA 92103
Price: $150
Comments: The Word Plus is a spelling checker, according to the review, that is preconfigured for WordStar. It has excellent documentation and many options, including total word count and count of word frequency.

The review says that the program's "on-screen menu permits viewing each word in context; you can then correct it, add it to the [45,000-word] dictionary, mark it in the file or ignore it." An auxiliary dictionary may also be created for proper names or technical terms. Reader Service number 419

(Reviewed in Softalk for the IBM Personal Computer, *May 1983)*

PCcrayon

System Requirements: IBM PC; DOS 2.0; 64K RAM; at least one disk drive; compatible printer
Manufacturer: PCsoftware, 4155 Cleveland Ave., San Diego, CA 92103
Price: $44.95
Comments: "This well-designed program" says the review, "can draw and store virtually any graphics shape or character font. Arcs, circles, straight lines or dots are easily combined with keyboard-entered text or specially created characters to form a seemingly endless variety of graphics images."

Although slow to dump a graphics drawing, states the review, the program "gets high marks for user-friendliness, with good use of prompts and effective error-trapping." Reader Service number 420

(Reviewed in Softalk for the IBM Personal Computer, *May 1983)*

Plan 1040

System Requirements: IBM PC; DOS 1.1; 64K RAM; one disk drive; IBM, Epson or compatible printer
Manufacturer: Software 1040, Division of Prentice-Hall Co., PO Box 1010, New Hyde Park, NY 11042
Price: $150
Comments: Plan 1040 is a program that figures alternatives in income tax preparation. The current version is set for the 1983 tax year, says the review, and it "is a superior piece of software that authors at home in the microcomputer world could learn from."

"As a piece of programming art," states the review, "Plan 1040 is rivaled so far only by 1-2-3. . . If Plan 1040 sets a performance standard, PC owners will have much to look forward to." Reader Service number 421

(Reviewed in Softalk for the IBM Personal Computer, *May 1983)*

The Composer's Assistant

System Requirements: Apple II or II Plus; 48K RAM; ROM Applesoft; at least one disk drive; alphaSyntauri keyboard and software; dot-matrix printer with graphics capability
Manufacturer: Syntauri Corp., 3506 Waverly St., Palo Alto, CA 94306
Price: $295
Comments: "This software package," states the review, "enables music keyboard performances played on the alphaSyntauri computer music system to be printed out as conventionally notated, hi-res scores."

"It transcribes accurately executed keyboard performances," concludes the review, "and spotlights exactly what is wrong with less-than-perfect playing. As such, The Composer's Assistant is a powerful addition to the alphaSyntauri's extensive musical repertoire." Reader Service number 418

(Reviewed in Softalk, *May 1983)*

The Printographer

System Requirements: Apple II; 48K RAM; ROM Applesoft; one disk drive; almost any printer with graphics capability
Manufacturer: Southwestern Data Systems, PO Box 582, Santee, CA 92071
Price: $49.95
Comments: "The Printographer," says the review, "is a utility program which processes high-resolution images on the Apple II computer and sends them to a printer." According to the review, most of the program is easy to use and it comes with clear and complete documentation.

"Its strongest feature," concludes the review, "is the manner in which it can easily be configured to work with whichever graphics printer you happen to have." Reader Service number 413

(Reviewed in COMPUTE!, *June 1983)*

High Rise

System Requirements: Apple II or II Plus; 48K RAM; ROM Applesoft; one disk drive
Manufacturer: Micro Fun/Micro Lab, 2310 Skokie Valley Road, Highland Park, IL 60035
Price: $39.95
Comments: The object of High Rise, according to the review, is to build a tower of odd-shaped boxes, climb it without it toppling over, and thus reach the next level of difficulty.

"Determining," says the review, "how to put the pieces together in such a way that the structure is stable stretches the ingenuity of the player. . . . People who enjoy solving challenging puzzles will find excitement and delight in each new level." Reader Service number 417

(Reviewed in Softalk, *May 1983)*

ASCII Express

System Requirements: Apple II, II Plus or IIe; Apple DOS; 48K RAM; one disk drive; a minimum of one serial interface card
Manufacturer: Southwestern Data Systems, PO Box 582, Santee, CA 92071
Price: $129.95
Comments: According to the review, ASCII Express converts your Apple II into a terminal capable of communicating with a local or remote large computer or with another microcomputer. Information can come from your keyboard or from a disk file.

Despite poor documentation, the review recommends the program highly and concludes that "The price is higher than that of alternative communications packages, but the ASCII Express's versatility and ease of use make the price worthwhile." Reader Service number 406

(Reviewed in InfoWorld, *April 4, 1983)*

Old Ironsides

System Requirements: Apple II or II Plus; 48K RAM; ROM Applesoft; one disk drive
Manufacturer: Xerox Education Publications, 245 Long Hill Road, Middletown, CT 06058
Price: $39.95
Comments: Old Ironsides, according to the review, is a sea-battle game that may be played by two people or one person against the computer. "The arena," says the review, "is a square area of sea upon which the wonderfully drawn hi-res ships do battle."

Fog and the difficulty of turning the big ships contribute to the excitement. "While Old Ironsides has a certain arcade feel to its play," concludes the review, "it's basically a game of skill and strategy." Reader Service number 414

(Reviewed in Softalk, *May 1983)*

TeleTari

System Requirements: Atari computer with Basic; 32K RAM; disk drive, modem and printer
Manufacturer: Don't Ask Software, 2265 Westwood Blvd., Suite B-150, Los Angeles, CA 90064
Price: $39.95
Comments: The review calls TeleTari "a highly adaptable communications package. It's advertised as 'The Friendly Terminal,' an appropriate term." According to the review, this is the first Atari terminal program to support the Bit 3, 80-column board.

With arrow-key paging of the buffer contents, a speedy Print option and excellent documentation on transferring files, this program, concludes the review, can give you "a whale of a time with your Atari." Reader Service number 411

(Reviewed in ANTIC, *May 1983)*

Hellcat Ace

System Requirements: Atari computer; Atari Basic cartridge; two joysticks
Manufacturer: MicroProse, One Caribou Court, Parkton, MD 21120
Price: $29.95, cassette or disk
Comments: The review states that Hellcat Ace "is the first real-time flight simulator for the Atari home computers. While the graphics are not stunning, the game plays well and holds your interest with multiple skill levels and a variety of scenarios."

"Fancy aerobatics are easily done," says the review. "Hellcat Ace is an effective flight/combat simulator. . . with enough varying difficulty to interest both the novice and the professional pilot." Reader Service number 409

(Reviewed in ANTIC, *May 1983)*

BASIC A +

System Requirements: Atari computer; at least 32K, preferably 48K RAM; disk drive
Manufactuer: Optimized Systems Software, 10379 Lansdale Ave., Cupertino, CA 95014
Price: $80
Comments: BASIC A +, says the review, "is a disk-based machine language version of the Basic language and is compatible with Atari Basic." You must own Atari's Basic reference manual, for the documentation with BASIC A + is only a supplement to that manual.

"BASIC A +," continues the review, "provides many new statements which will make things easier and quicker. . . For anyone who wishes to use a powerful Basic while still remaining compatible with Atari Basic, this is the way to go!" Reader Service number 410

(Reviewed in ANTIC, *May 1983)*

Logic Simulator/Logic Designer

System Requirements: Apple II or II Plus; 48K RAM; ROM Applesoft; preferably two disk drives
Manufacturer: Spectrum Software, 690 West Fremont Ave., Sunnyvale, CA 94087
Price: $250
Comments: This program's goal, according to the review, is to help the electronics designer build and test prototype circuits. "The Logic Designer module," states the review, "allows drawing a circuit in schematic form by placing the various gates and flip-flops on a gridded pattern on the CRT. . . . The completed circuit is automatically saved to disk before being analyzed with the Logic Simulator module."

Although the program is disk-intensive, and hence rather slow, continues the review, it is unquestionably a timesaver. "With a capacity," concludes the review, "for one thousand gates, sixteen shift registers, sixteen separate user-defined macros and more, the Logic Simulator is indeed a formidable piece of software." Reader Service number 415

(Reviewed in Softalk, *May 1983)*

MAG/base

System Requirements: 8080, 8085, Z-80, 8086, 68000 or Z-8000 CPU, depending on version; CP/M, MP/M, CP/M-86, MP/M-86 or UNIX; 48K or 54K RAM; two floppy disk drives or hard disk drive; CRT with 24 × 80 screen, clear screen and cursor addressing; 80- to 132-column printer and additional CRT abilities recommended
Manufacturer: Micro Applications Group, 7300 Caldus Ave., Van Nuys, CA 91406
Price: $295 to $795, depending on level purchased
Comments: "MAG/base," says the review, "is a database management system" with which "you can define files, change their contents, search for records that fall into a specific category, prepare forms and letters and produce advanced reports, *all with no programming*."

The program, especially appropriate in business environments, according to the review, comes at three levels; its error handling is good and its documentation is excellent. The review concludes: "I offer my congratulations to Micro Applications Group for bringing a well-implemented, easy-to-use database-management system to the microcomputer community." Reader Service number 404

(Reviewed in InfoWorld, *March 14, 1983)*

Solarsoft

System Requirements: Apple II Plus; 48K RAM; two disk drives; 80-column printer optional
Manufacturer: Solarsoft, Inc., PO Box 124, Snowmass, CO 81654
Price: $700 for entire package
Comments: Solarsoft is a four-program design package for passive solar buildings. According to the review, Sunpas, the first program, "can quickly estimate the auxiliary heating requirements and solar contribution of a passive solar building." A second program, Sunop, "calculates life-cycle costs of the passive solar system or determines the optimal mix of energy conservation and passive solar features for particular design and system cost regimes."

Tswing, states the review, is a thermal analysis program that calculates temperatures at certain locations in a building, and the last, Solgain, "calculates the clear-day solar gains on the twenty-first day of each month." The programs of this package, concludes the review, "are the state of the art in microcomputer estimation techniques. . . . They are a quick and inexpensive alternative to mainframe simulation methods." Reader Service number 412

(Reviewed in BYTE, *May 1983)*

A BASIC Compiler (ABC)

System Requirements: Atari computer; at least 40K RAM; one disk drive
Manufacturer: Monarch Data Systems, PO Box 207, Cochituate, MA 01778
Price: $69.95
Comments: "ABC," says the review, "can make your Atari Basic programs run from four to twelve times faster and possibly use less memory." ABC reads your Basic programs from disk, translates them into P-code and then writes a compiled version onto disk.

Your programs must be bug-free to begin with, and some Basic commands are not supported and must be removed, but the review concludes that "I found ABC to be quite friendly and easy to use. I highly recommend it to professional software developers and hobbyists alike." Reader Service number 408

(Reviewed in ANTIC, *May 1983)*

Black Jack Strategy

System Requirements: Apple II or II Plus; 48K RAM; ROM Applesoft; one disk drive
Manufacturer: Soft Images, 200 Route 17, Mahwah, NJ 07430
Price: $69.95
Comments: "Black Jack Strategy," says the review, "presents a basic, no frills approach to blackjack, mostly designed for the novice. . . . The program does what it says it will do." It does not, however, deal with advanced skills like card counting.

According to the review, the graphics displays are good and the manual helpful. The review concludes that "Black Jack Strategy is terrific for people who are casually interested in blackjack." Reader Service number 416

(Reviewed in Softalk, *May 1983)*

Gertrude's Secrets and Puzzles

System Requirements: Apple II; DOS 3.3 or Applesoft; one disk drive; color TV or monitor
Manufacturer: The Learning Company, 4370 Alpine Road, Portola Valley, CA 94025
Price: $75 each
Comments: According to the review, Gertrude's Secrets and Gertrude's Puzzles are two of a series of six programs developed by the Learning Company as educational software for preschoolers to early teens. The goal is interactive learning by discovery and by making choices that strengthen logic and reasoning.

The manual, states the review, is "sparse," but the on-screen documentation is helpful. The review concludes that "Parents wishing to buy innovative, creative software that can teach as well as entertain their young children will be hard pressed to find any better." Reader Service number 405

(Reviewed in Infoworld, *February 14, 1983)*

ANTIC, 297 Missouri St., San Francisco, CA 94107.

BYTE, 70 Main St., Peterborough, NH 03458.

Classroom Computer News, published by Intentional Educations, Inc., 341 Mt. Auburn St., Watertown, MA 02172.

COMPUTE!, published by Small System Services, Inc., PO Box 5406, Greensboro, NC 27403.

InfoWorld, published by Popular Computing, Inc., 375 Cochituate Road, Box 880, Framingham, MA 01701.

Softalk and *Softalk for the IBM Personal Computer*, 11160 McCormick St., North Hollywood, CA 91601.

Table. Addresses of the magazines publishing the software reviews digested in this department.

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C-Itoh F-10	5.50	1.68
Diablo Hytype I	5.50	1.59
Diablo Hytype II	5.50	1.68
DEC LA34	5.50	2.03
Epson MX-70, MX-80	6.50	2.93
Epson MX-100	9.75	4.45
IBM PC (MX-80)	6.50	2.93
IBM PC (MX-100)	9.75	4.45
MPI 88G, 99G, 150	13.50	2.93
NEC 3500	TBA	2.43
NEC Spinwriter	5.50	2.43
NEC PC 8023A-01	5.50	2.43
Okidata Microline 80, 82, 83 (spool)	2.50	
R.S. DW II (1449)	TBA	2.08
R.S. DMP 200 (1483)	TBA	2.93
R.S. DMP 400, (1418)	5.50	1.68
R.S. DMP 500 (1482)	TBA	2.93
R.S. DWP 410 (1449)	TBA	2.08
R.S. LP6, LP8 (1418)	5.50	1.68
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Vic 20

CLUBLIST: Granny uses this program to keep track of her quilting club. Records names etc., dues expiration; prints out roster. 8K Version up to 25 members, 16K Version 90. $11.95

MATH DRILL: This one is so all the younguns can practice their ciphers. 3 levels of difficulty on all four arithmetic operations. $9.95

MORSE CODE: Drills user in code recognition $9.95

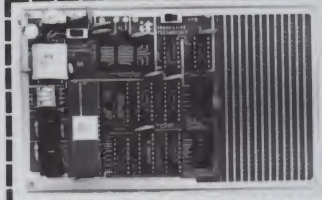
AMORTPRINT: Compute payment amount & print an amortization table. $9.95

If you want a program list or have a dandy program for sale write to Grandma's.

Grandma's Software
Box 1105
San Bernardino, California 92402

Califomia folks please add 6% for sales tax.

Circle 128 on Reader Service card.



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The APB is an excellent **educational aid** which allows for evaluation and familiarization of 6801 family members. It is great for **prototype development.** Since the nuts and bolts are already in place, the designer need only add the necessary interface circuits for a particular application. It can also be used as a simple cost-effective **dedicated controller** for those limited quantity applications.

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In Search of Better Floppy Performance

This article answers the question, "How do I increase floppy disk performance?" and helps you choose a density level you can live with.

By John Potochnak

My microcomputing system's hardware arrived approximately two months before the software. This caused a variety of learning experiences—one of which was the quest for better floppy disk performance.

My experiences with the delivery of hardware had been so traumatic that I wasn't going to wait for the software to be delivered. This turned out to be a good move; it took less than a week to get a single-density BIOS (Basic Input/Output System) for CP/M version 2.2 coded and running.

The BIOS is the part of CP/M that is hardware-dependent, therefore changing from machine to machine. The BDOS (Basic Disk Operating System) calls the BIOS to perform operations such as the reading or writing of a disk sector. The BIOS changes these logical requests into whatever sequence of instructions is necessary to accomplish them on the hardware it supports. The BDOS is hardware-independent, and serves as a machine-independent interface for user programs.

The standard eight-inch, single-density disk was amazingly unimpressive with respect to performance. Additionally, with 26 sectors per track, it provided only 241K of user file space. As a result, it lasted only a few days before double density was up.

Not only did double density provide a reasonable increase in performance, but with 50 sectors per track, it provided 464K of user file space.

Skewing Around

The skewing factor for both single- and double-density disks is the same. Skewing factors attempt to anticipate the amount of computing that will be done on a disk sector so that rotational delays are minimized when the next sector is accessed.

Before the BDOS calls the BIOS to read or write, it calls the BIOS with a logical sector number; the BIOS sector translation routine returns the physical sector number corresponding to that logical sector number. The BDOS then uses this physical sector number in doing the data transfer. This is called sector translation; it allows the user to control or experiment with skewing.

The skewing factor for both single and double density is 6, which means that for logical sectors 1, 2 and 3, physical sectors 1, 7 and 13 actually would be accessed. The time it takes for the disk to rotate over the six intervening sectors gives the processor a chance to do something with the current sector's data. Therefore, a program load is slowed down by a skewing factor of 6, since it does nothing with the current sector but dump it to memory.

However, an assembly may be able to process one sector's worth of source file in time to read the next sector, thus saving a rotation. So you can see that the skewing factor you select depends on what you're doing. I tried 4 and 12, and both were faster for some things and slower for others.

A skewing factor of 6 cuts half the time distance between sectors on double density when compared to single density. This is because there are almost twice as many sectors around a track on double density, making the distance between sectors roughly half that of single density.

At first I chose to halve the time distance because the single-density skewing factor had been selected when CPUs were much slower. Later I found 6 to be optimal in my environment.

Note that a skewing factor greater than 1 may be required to prevent missing the next sector every time. If the processor is unable to get back to the disk controller in time to read the next sector, even during a program load, a rotation per sector will be wasted. This results in a significant decrease in performance.

Double density lasted for about six weeks while I became familiar with the machine. By this time I was starting to peruse sections of the CP/M manuals that I had neglected.

The Alteration Guide includes an example for hard disks that indicates that storage capacity and performance could be increased dramatically by increasing the physical sector size. Since capacity was not a problem, any additional disk space made available would be used for performance improvement.

A Repeating Pattern

The spec sheets for the WD-1795 disk controller chip and a few calculations indicated that a sector size of 512 bytes would allow for an increase in capacity of 25 percent. This is caused by the way in which a disk is formatted.

Roughly, there is a repeating pattern of sector header, gap, sector data record and gap around the disk. The gap after the sector header gives the disk controller time to recover so that it can read or write the data record. The gap after the data record is required since a write to disk may be slightly longer or shorter than last time.

The difference in written size could be caused by slight speed variations in disk rotation, temperature changes or tolerances in disk drives. The capacity

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increase is the result of fewer sector headers and fewer gaps. Larger sectors (1024 bytes) did not increase disk capacity and had the drawback of requiring a larger blocking/deblocking buffer in the BIOS. (More on sector blocking/deblocking later.)

The hope was that increasing the sector size would decrease the number of physical I/Os, resulting in an increase in performance. In fact, this was the case, but the performance increase was not as spectacular as I had hoped.

Since the goal was increased performance, I decided to select a density and direct all efforts toward its performance.

Single density was out because its capacity was simply too limited. Double density had the possibility of being compatible with other machines, but I found out that double-density compatibility was destined to remain a dream. Since the larger sector format, which eventually was named Extended Density (ED), provided both greater capacity and a performance advantage, it was chosen.

Extended density boasts 16 512-byte sectors per track, giving a disk capacity of 512 × 16 × 77 tracks = 616K on a single-sided, eight-inch disk. Two tracks are allocated for booting and the directory is 4K, leaving 596K available for file storage. The cluster or allocation size is 4K; therefore, each file is a multiple of 4K in length. This wastes more space than a cluster size of 2K.

The reason for adopting the larger cluster size was the amount of file that could be pointed to by one directory entry. If 4K is used, one directory entry can represent 64K of file. If 2K is used, only 16K of file can be represented. Fewer directory entries means fewer directory accesses, which should help increase performance. I never did do any tests with a 2K cluster size, so I can't say that the larger cluster size gives a measurable increase in performance.

Byte Business

A CP/M directory entry is a 32-byte record. The first 16 bytes hold information such as the file name, name extension and which extent this is. The second 16 bytes are pointers to the file data. They will be single-byte pointers if the disk holds 256 or fewer clusters; otherwise, they'll be double-byte pointers, allowing for a disk with 65,536 clusters. If a file cannot be represented by one directory entry, enough additional directory entries

will be allocated to represent the file. Each 32-byte directory entry is also called a physical extent.

Going from 64K per directory entry to 16K is caused by the switch from single-byte cluster pointers to double-byte cluster pointers. The number of 2K clusters is 300 on an extended density disk, and 300 is bigger than 255, which is the largest cluster number that can be represented in an eight-bit byte. The number of 4K clusters is only 150, which can be represented in a single-byte pointer. So, 16 pointers at 4K per pointer yield 64K per directory entry; eight double-byte pointers at 2K per pointer yield only 16K per directory entry.

CP/M expects all disk transfers to be done in 128-byte chunks. This forces the BIOS to block/deblock the larger sectors for CP/M, effectively making the larger sector size invisible outside of the BIOS.

Initially, the same blocking/deblocking code that appeared in the Alteration Guide was installed in the BIOS. The result was about a 20 percent decrease in wall-clock time to perform an assembly, with listing, over double density. Unfortunately, I no longer have a version of the BIOS with this scheme installed. It would have been nice to include this scheme in the timing table.

Standard Blocking/Deblocking

The standard blocking/deblocking scheme performs one optimization. It utilizes the type-of-write information passed to the BIOS routine to avoid prereading sectors. Prereading may be necessary because each physical sector contains four CP/M sectors.

CP/M expects all disk transfers to be done in 128-byte chunks. This forces the BIOS to block/deblock the large sector for CP/M...

The BIOS does not know, when it wants to write a 128-byte CP/M sector, whether other CP/M sectors in the physical disk sector already have been written. Since the hardware permits only full-sector reads or writes, the BIOS may have to read the 512-byte physical sector and deposit the 128-byte CP/M sector into it in order to write.

The BDOS passes information to the BIOS on each write. The writes may be one of three types: a normal write, a directory write or a write to the first sector of an unallocated cluster.

The unallocated write type is used by the standard scheme to set a counter allowing prereads to be avoided for the entire cluster, provided the entire cluster is written in order. This makes a big difference for certain types of I/O; for example, simple file transfers tend to run about twice as fast as they would without this optimization.

This simple scheme has one problem. If a few sectors of the unallocated cluster were written and then it became necessary to read or write somewhere else, the benefit of not prereading would be lost when you returned. With this in mind, I believed that if vectors representing allocated but unwritten disk sectors were maintained, one could cut down significantly on prereads. The case in mind was an assembly that read a source and wrote an object file and a listing. The code did cut down on prereads, but the overall decrease in wall-clock time was only three percent.

Undaunted, I decided that perhaps a hardware solution might be in order. In minicomputerland, disks are cached on a variety of machines. Since green actually would have to be coughed up for a cache memory bank, painstakingly detailed research was in order to be sure that the cash outlay would be justified. CP/M was moved down to the 48K boundary to free up the 16K above it for a cache. A truly Spartan, simplistic caching scheme was coded and an assembly was timed. I then ran out and bought another 64K RAM.

The caching scheme reads/writes file data in cluster-size chunks. For example, reading a 128-byte sector in the first 4K of a file will cause the entire cluster to be transferred into a cache buffer. Subsequent reads will access only the cache buffer. No I/O-to-disk will occur until a cluster boundary is crossed.

Writes are also done into cluster-size cache buffers. These buffers stay around, resulting in a substantial decrease in disk I/Os.

Disk Cache Results

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Density	SD	DD	ED		ED unalloc		ED cache	
Skewing factor	6	6	2	1	2	1	2	1
TYPE	98	90	70	70	69	70	63	62
C Compile	435	385	380	397	360	396	345	341
ZASM with listing	633	540	500	503	420	493	174	167
ZASM without listing	222	207	151	155	148	153	112	109
PIP two disks	53	28	31	47	13	46	17	13
PIP one disk	52	29	29	36	13	47	15	14
ASM with listing	84	64	72	72	68	69	43	41
26K program load	10	6	2.5	9	2.5	9	3	2

Legend

SD	Single density
DD	Double density
ED	Extended density (no optimizations)
ED unalloc	Extended density (unallocated optimization)
ED cache	Extended density (24K of cache)

Table 1. Performance results of different density labels. Table shows time in seconds to complete various tests.

disk cache. Even for intensely processor-bound activities such as the C compile, the wall-clock time to perform the compile was down by 11 percent from double density. Intensely active I/O programs, like the Z-80 assembler, were running jobs through in less than a third of the original time.

The final caching scheme is as follows: The allocation size of 4K (which is half a track) was chosen as the cache buffer size. This greatly simplified the code, and it probably is efficient, since a cache buffer contains data for only one CP/M file.

A single read from disk transfers 32 128-byte CP/M sectors. The 512-byte physical sectors are not skewed; skewing is not necessary because the data is transferred as one continuous block into a cache buffer. On a write from cache, only those sectors in the buffer that have been modified are written.

Originally, extended density was hardware skewed by 2. The skewing factor of 2 was necessary because the processor did not always get back in time to read the next block in sequence.

Since the skewing was done by writing skewed sector numbers in the sector headers, skewed and nonskewed disks can be used by both the caching and the noncaching schemes. This is true because the BIOS does not have to know about the skewing—it occurs in disk-controller hardware, which performs the sector header search. There are just some performance trade-offs.

With no skewing factor, the latency (the time you must wait for the desired sector to come around to the read/write head) and the actual read/write require, on the average, only one rotation. For a skewing factor of 2, latency plus transfer time equals 1½ rotations.

Flushing Buffers

A directory write flushes all cache buffers for that drive before writing the directory block. The directory is not cached. This is simply for protection. If the directory were cached, you could change a disk, and CP/M's directory checksum would not catch the change. This would make it easy to damage the disk.

Boot tracks are not cached, either; they're loaded sequentially into memory, and the cache offers no benefit in this case. The cache buffer selection algorithm also makes it not worthwhile to cache the boot tracks, since any reasonable amount of work will flush the boot data from cache.

Finally, since the directory is not cached, it must be read *after* a reboot to log in the disk. This means that the head would be engaged right after the reboot anyway, so the additional cost of reading the boot tracks is small.

One other minor optimization was added later when I discovered that simple I/O operations (e.g., file transfers) suffered a little due to the

overhead imposed by the cache. The optimization was that cache buffers filled by writes are flushed immediately and not aged. This allows a full cache buffer—which you probably will not use again—to go out immediately, making it available for use.

The caching scheme originally was built on top of the sector blocking/deblocking code. For this reason, all disk data goes through the sector blocking/deblocking buffer. In a purely caching BIOS, this isn't necessary, since the desired sector can be extracted directly from the cache buffer, saving some time.

The sector blocking/deblocking buffer still is required for directory reads and writes, and it's handy for utilities that write the disk independently of the BDOS. These utilities can call the BIOS directly, specifying that their write is a directory write, whether it is or is not, thus insuring an immediate write to disk.

The actual cache buffers are in the second RAM bank. All disk I/O on extended density (except for the boot tracks and directory I/O) go through this RAM bank. The data is moved from and to the cache buffer to and from the sector blocking/deblocking buffer.

The blocking/deblocking code takes care of getting the 128-byte sector requested by the BDOS and putting it into the location requested by the BDOS. The number of 4K cache buffers currently is six; more buffers didn't give an appreciable increase in performance. This uses up only 24K of the second RAM bank, allowing much of the BIOS to be moved into the second bank.

> The extra RAM bank cost me less than $300. The increase in performance easily offset this cost.

LRU Scheme

The scheme for selecting a cache buffer is LRU (Least Recently Used). This is easy to implement; each time a cache buffer is touched, it is made the youngest. When a buffer is needed for a read or write, the oldest is selected. Selection will dump any modified sectors to that cache buffer.

The following advantages "fell" out of the caching scheme. The cache is much easier on the disk drives. Reads and writes tend to happen much less often. The continuous head movement caused by a program reading a source and writing both an object and a listing is gone. Programs that bounce back and forth between two (or more) disk drives get 32 sectors per bounce rather than one, so the constant clunking is gone. When you work with small files, you tend to run entirely in the cache.

After going through this process, it seemed amazing that many small business systems don't have a caching BIOS as an option. The extra RAM bank cost me less than $300. The increase in performance easily offset this cost when the $3500 cost of the system was considered.

Additionally, the extra bank allows the BIOS to grow in size and functionality without impacting the limited space available to programs running under CP/M. My BIOS is more than 4K; 3K of it is in the second RAM bank, allowing a 63K CP/M to be used.

See Table 1 for the wall clock times required to perform certain common functions. The hardware used for these tests was manufactured by SD Systems. The CPU was SD's SBC-200, and 4 MHz CPU board; RAM consisted of two ExpandoRAM-II 64K boards. The disk controller was a Versafloppy-II. Two Shugart 801 single-sided, double-density, eight-inch disk drives were used.

One deviation from off-the-shelf hardware was that the disk I/O was done through a DMA controller. I/O is not overlapped with processing; the only reason for the DMA controller is to allow type-ahead. So if anything, disk I/O is slightly slower than with the non-DMA off-the-shelf system.

The same initial conditions for each test were used at each density/skewing factor. A blank disk was used to start each test. The times in Table 1 therefore are best cases, since the disk was not fragmented. (Fragmented means that the disk has been in use for a while, so that deleting or creating files has forced the allocation of clusters to a file to be noncontiguous. Note that the more fragmented the

disk, the better the advantages of cache over noncache, because so much head movement is eliminated.)

The following files were PIPed to each disk in the order listed:

For the C compile:
- SuperSoft C parser
- SuperSoft C code generator
- 1K run time source code linkage module
- 24K C test program

After the compile:
- 32K pseudo-code file generated by parser
- 66K .ASM file generated by code generator

For the Z-80 assembly without a listing:
- SD Systems ZASM assembler
- 59K Z-80 test program

After the assembly:
- 9K object file
- 160K listing

For the Z-80 assembly without a listing:
- SD Systems ZASM assembler
- 59K Z-80 test program

After the assembly:
- 9K byte object

> The CP/M assembler did not show such a marked improvement over double-density, so it probably does its I/O in more sectors.

For the Type:
- 59K Z-80 test program

For the disk-to-disk PIP (two drives):
- PIP
- 59K test file

After the PIP:
- Second disk, originally blank, contained the 59K test file

For the disk-to-disk PIP (one drive):
- PIP
- 59K test file

After the PIP:
- Same disk contained two copies of the test file

For the CP/M ASM assembler test:
- ASM
- 21K test program consisting of the statements ORG 100H, 1500 times "LXI H,0000H", END.

After the assembly:
- 13K object file written by assembler
- 44K listing file written by assembler

For the program load:
- 26K .COM file

Keep in Mind . . .

When examining Table 1, you should take the following considerations into account.

The single-density disk was nearly filled by the Z-80 assembly, with listing, so the distance the head had to move was at a maximum. The same test on ED filled a little more than a third of the disk.

The SD assembler (ZASM) seems to read and write only a sector at a time. The result is that it performs poorly without the cache, since there is excessive head movement.

The CP/M assembler did not show such a marked improvement over double density, so it probably does its I/O in a larger number of sectors. Also, since the ASM program had no comments, it was "denser" than the SD assembler test program. This could account for the smaller performance improvement.

The two columns (in Table 1) labeled "ED" and "ED unalloc" with a skewing factor of 1 show what happens when too small a skewing factor is selected. In these cases, the software couldn't get back to the disk controller in time to read or write the next sector without losing a rotation—even on a program load.

Most tests were from the carriage return, which invoked the tests until the CP/M prompt printed; therefore, they included the reboot. The PIP tests were exceptions to this; they were from PIP prompt until the next PIP prompt.

The Type test was done using the CP/M type command and therefore did not include a reboot. For the C compile, which required two commands, the second command was typed ahead so no time would be lost after the first phase finished.

Bear in mind that only a small subset of the number of the options available were tried. This was due to laziness, or, more likely, not thinking of them.

If you have found ways to achieve better floppy performance, I certainly would like to read about them.■

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2708, 2716, 2732 EPROM programmer with software

MEM-99520K *Kit with software* — **$189.95**
MEM-99520A *A & T with software* — **$249.95**

32K PROM/RAM Board

The 32K S-100 PROM/RAM board can hold up to 16 each 2716 style EPROMs, 6116 style RAMs, or 8 each style EPROMs. This board was designed to fit into holder S-100 systems as well as the newer IEEE-696 machines. Uses 5 volt only EPROM/RAMs, allows operation as a 2K to 32K board, meets IEEE-696 S-100 proposed standard, addressable as two 16K blocks on any 64K page, supports Cromemco as well as Northstar bank select, perfect for MP/M systems

MEM-99153B *Bare board & manual* — **$49.95**
MEM-99153K *Kit with No RAM* — **$89.95**
MEM-99153A *A & T with No RAM* — **$139.95**
MEM-16153K *Kit with 16K RAM* — **$129.95**
MEM-16153A *A & T with 16K RAM* — **$179.95**
MEM-32153K *Kit with 32K RAM* — **$179.95**
MEM-32153A *A & T with 32K RAM* — **$229.95**
Call Us For Lowest Prices On EPROMs - 2732s — **$4.90**

Video Monitors

Video Monitors - USI

Ultra-high (1000 lines) resolution, 20 MHz bandwidth. Available in 9 inch or 12 inch, amber or green screen. USI is the "Cadillac" of monochrome video monitors!

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VDM-741220 *12" green* — **$159.95**
VDM-741210 *12" amber* — **$179.95**

S-100 CPU Boards

SBC-200 - SD Systems

4 MHz Z-80A CPU with serial & parallel I/O, 1K RAM, 8K ROM space, monitor PROM included

CPC-30200A *A & T* — **$329.95**

The Big Z - JADE

2 or 4 MHz switchable Z-80 CPU board with serial I/O, accommodates 2708, 2716, or 2732 EPROM, baud rates from 75 to 9600

CPU-30201B *Bare board w/manual* — **$35.00**
CPU-30201K *Kit with Manual* — **$149.95**
CPU-30201A *A & T with Manual* — **$199.95**

2810 Z-80 CPU - C.C.S.

2 or 4 MHz Z-80 CPU with serial I/O port & on board monitor PROM, front panel compatible

CPU-30400A *A & T with PROM* — **$289.95**

CPU-Z CompuPro

2 or 4 MHz Z-80A CPU, 24 bit addressing

CPU-30500A *2/4 MHz A & T* — **$279.95**
CPU-30500C *3/6 MHz CSC* — **$374.95**

8085/8088 - CompuPro

Both8 & 16 bit CPUs, standard 8 bit S-100 bus, up to 8 MHz, accesses 16 Megabytes of memory

CPU-20510A *MHz A & T* — **$398.95**
CPU-20510C *6/8 MHz CSC* — **$479.95**

Dual Disk Sub-Systems

Disk Sub-Systems - JADE

Handsome metal cabinet with proportionally balanced air flow system, rugged dual drive power supply, power cable kit, power switch, line cord, fuse holder, cooling fan, never mar rubber feet, all necessary hardware to mount 2-8 inch disk drives, power supply, and fan, does not include signal cable

Dual 8-inch Sub-Assembly Cabinet

END-000420 *Bare cabinet* — **$49.95**
END-000421 *Cabinet kit* — **$199.95**
END-000431 *A & T* — **$249.95**

8-inch Sub-Systems - Single Sided, Double Density

END-000423 *Kit w/2 Siemens FD100-8Ds* — **$650.00**
END-000424 *A & T w/2 Siemens FD100-8Ds* — **$695.00**
END-000433 *Kit w/2 Shugart SA-801Rs* — **$999.95**
END-000434 *A & T w/2 Shugart SA-801Rs* — **$1195.00**

8-inch Sub-Systems - Double-Sided Double Density

END-000426 *Kit w/2 Qume DT-8s* — **$1274.95**
END-000427 *A & T w/2 Qume D-8s* — **$1474.95**
END-000436 *Kit w/2 Shugart SA-851Rs* — **$1274.95**
END-000437 *A & T w/2 Shugart SA-851Rs* — **$1474.95**

EPROM Erasers

Ultra-Violet EPROM ERASERS

Inexpensive erasers for industry or home

XME-3100A *Spectronics w/o timer* — **$69.50**
XME-3101A *Spectronics with timer* — **$94.95**
XME-3200A *Logical Devices* — **$49.95**

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5¼ inch Disk Drives

Tandon TM 100-1 *single sided, double density 48 TPI*
MSM-551001 _____ $219.95 ea 2 for **$199.95 ea**

Shugart SA 400L *Sigle sided, double density 40 track*
MSM-104000 _____ $234.95 ea 2 for **$224.95 ea**

Tandon TM 100-2 *Double sided, double density 48 TPI*
MSM-551002 _____ $294.95 ea 2 for **$269.95 ea**

TEAC FD55A *Single sided, double density 40 track*
MSM-660551 _____ $299.95 ea 2 for **$239.95 ea**

5¼ inch Cabinets with Power Supply

END-000216 *Single cab w/power supply* _____ **$69.95**
END-000226 *Dual cab w/power supply* _____ **$94.95**

S-100 Motherboards

ISO-BUS - JADE

Silent, simple and on sale - a Better Motherboard

6 Slot (5¼ inch x 8⅝ inch)

MBS-061B *Bare board* _____ **$22.95**
MBS-061K *Kit* _____ **$39.95**
MBS-061A *A & T* _____ **$69.95**

12 Slot (9¾ inch x 8⅝ inch)

MBS-121B *Bare board* _____ **$34.95**
MBS-121K *Kit* _____ **$69.95**
MBS-121A *A & T* _____ **$109.95**

18 Slot (14½ inch x 8⅝ inch)

MBS-181B *Bare board* _____ **$54.95**
MBS-181K *Kit* _____ **$99.95**
MBS-181A *A & T* _____ **$149.95**

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Siemens FDD 100-8 *Single sided, double density*
MSF-201120 _____ $274.95 ea 2 for **$249.95 ea**

Shugart SA 801R *Single sided, double density*
MSF-10801R _____ $394.95 ea 2 for **$389.95 ea**

Shugart SA851R *Double sided, double density*
MSF-10851R _____ $554.95 2 for **$529.95 ea**

Qume DT-8 *Double sided, double density*
MSF-750080 _____ $554.95 2 for **$529.95 ea**

Tandon TM848-1 *Single sided, double density thin line*
MSF-558481 _____ $379.95 ea 2 for **$369.95 ea**

Tandon TM848-2 *Double sided, double density thin line*
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MSF-558482 _____ $485.00 ea 2 for **$449.95 ea**

NEW! CP/M plus 3.0

CP/M 3.0 is Digital Research's latest version of the industry standard disk operating system. It features many performance improvements, such as intelligent record buffering, improved diretory handling, "HELP" facility, time date stamping of files and many more improvements. AND A TREMENDOUS INCREASE IN SPEED!! it is fully CP/M 2.2 compatible and requires no changes to your existing application software. Available only to Versafloppy II owners with SBC-200 CPUs

SFC-55009059F *Unbanked.* _____ **$250.00**
SFC-55009057F *Banked.* _____ **$250.00**
SFC-55009057D *Manual* _____ **$50.00**

CP/M Plus On EPROM

SFC-55009059E *Unbanked RS232* _____ **$400.00**
SFC-55009057E *Banked RS232* _____ **$400.00**

Modems

Smart Buy in MODEMS - Signalman

1200 and/or 300 baud, direct connect, automatic answer or originate selection, auto-answer/auto-dial on deluxe models. 9v battery allows total portability, full one year warranty

IOM-5600A *300 baud direct connect* _____ **$89.95**
IOM-5610A *300 baud Deluxe* _____ **$149.95**
IOM-5620A *1200/300 baud Deluxe* _____ **$369.95**
IOM-5650A *300 baud for Osborne* _____ **$119.95**
IOM-5630A *300 baud card for IBM* _____ **$269.95**

Smartmodem - HAYES

Sophisticated direct-connect auto answer/auto dial modem, touch tone or pulse dialing. RS-232C interface, programmable

IOM-5500A *Smartmodem 1200* _____ **$599.95**
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IOM-1100A *Micromodem 100* _____ **$368.95**
IOM-2010A *Micromodem II w/term prgm* _____ **$329.95**
IOM-2012A *Terminal program for MMII* _____ **$89.95**
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1200 Baud Smart Cat - NOVATION

103/212 Smart Cat & 103 Smart Cat, 1200 & 300 baud, built-in dialer, auto redial if busy, auto answer/disconnect, direct connect, LED readout displays mode, analog/digital loopback self tests, usable with multi line phones

IOM-5241A *300 baud 103 Smart Cat* _____ **$229.95**
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J-CAT Modem - NOVATION

1/5 the size of ordinary modems, Bell 103, manual or auto-answer, automatic answer/originate, direct connect, built in self test, two LEDs and audio beeps provide status information

IOM-5261A *Novation* _____ **$149.95**

S-100 Disk Controllers

DISK 1 - CompuPro

8 inch or 5¼ inch DMA disk controller, single or double density, single or double sided, 10MHz

IOD-1810A *A & T* _____ **$449.95**
IOD-1810C *CSC* _____ **$554.95**

Versafloppy II - SD Systems

Double density disk controller for any combination of 5¼ inch and 8 inch single or double sided, analog phase locked loop data seperator, vectored interrupts. CP/M 2.2 Oasis compatible, control/diagnostic software PROM included

IOD-1160A *A & T with PROM* _____ **$359.95**
SFC-55009047F *CP/M 3.0 with VF-11* _____ **$139.95**

2422 Disk Controller - C.C.S.

5¼ inch or 8 inch double density disk controller with on board boot loader ROM, FREE CP/M 2.2 & manual set

IOD-1300A *A & T with CP/M 2.2* _____ **$399.95**

Double D - JADE

High reliability double density disk controller with on board Z-80A, auxiliary printer port. IEEE S-100 can function in multi-user interrupt driven bus

IOD-1200B *Bare board & hdwr man* _____ **$59.95**
IOD-1200K *Kit w/hdwr & sftwr man* _____ **$299.95**
IOD-1200A *A & T w/hdwr & sftwr man* _____ **$325.95**
SFC-59002001F *CP/M 2.2 with Double D* _____ **$99.95**

Single Board Computer

Superquad - ADV. MICRO DIGITAL

Single board standard size S-100 computer system, 4 MHz Z-80A single or double density disk controller for 5¼ inch or 8 inch drives, 64K RAM extended sddressing, up to 4K of EPROM, 2 serial & 2 parallel I/O ports, real time interrupt clock, CP/M compatible

CPC-3800A *A & T* _____ **$724.95**
IOX-4232A *Serial I/O adapter* _____ **$29.95**

8" Slimline Sub-Systems

Dual Slimline Sub-Systems - JADE

Handsome vertical cabinet with scratch resistant baked enamel finish, proportionally balanced air flow system, quiet cooling fan, rugged dual drive power cables, power switch, line cord, fuse holder, cooling fan, all necessary hardware to mount 2-8 inch slimline disk drives, does not include signal cable

Dual 8-inch Slimline Cabinet

END-000820 *Bare cabinet* _____ **$59.95**
END-000822 *A & T w/o drives* _____ **$179.95**

Dual 8-inch Slimline Sub-Systems

END-000823 *Kit w/2 SS DD* _____ **$919.95**
END-000824 *A & T w/2 SS DD* _____ **$949.95**
END-000833 *Kit w/2 DS DD* _____ **$1149.95**
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Accessories for Apple™ II

DISK DRIVE - Apple™ Compatible

Totally Apple™ compatible, 143,360 bytes per drive on DOS 3.3, full one year factory warranty, half track capability reads all Apple software, plugs right into Apple controller as second drive, DOS 3.3, 3.2.1 Pascal & CP/M compatible

MSM-431010 *Drive for Apple* _____ **$239.95**
MSM-431030 *Controller only* _____ **$59.95**
MSM-431040 *Controller w/software* _____ **$99.95**

16K RAM Card for Apple™ II

Expand your Apple™ II to 64K, use as language card, full one year warranty. Why spend $175.00?

MEX-16700A *Save over $115.00* _____ **$49.95**

Z-CARD for Apple™ II - A.L.S.

Two computers in one, Z-80 & 6502, more than doubles the power and potential of your Apple, includes Z-80 CPU card CP/M 2.2 and complete manual set, Pascal compatible, utilities are menu-driven, one year warranty

CPX-62800A *A & T with CP/M 2.2* _____ **$149.95**

80 COLUMN Apple Card

80 column x 24 line video card for Apple II, addressable 25th status line, normal/inverse or high/low video, 128 ASCII characters, upper and lower case, 7 x 9 dot matrix with true descenders. CP/M, Pascal & Fortran compatible. 50/60 Hz. 40/80 column selection from keyboard. Best 80 column card!

IOV-2450A *Viewmax 80* _____ **$149.95**
IOV-2455A *Preboot disk for above* _____ **$29.95**

Serial I/O Card - A.L.S.

Full feature serial card for modems & printers, baud rates from 110 to 19,200, CTC/RTS & X-on/X-off protocols, auto line feed, RS-232C cable interface included

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CP/M 3.0 Card For Apple™ - A.L.S.

The most powerful card available for your Apple!

6 MHz, Z-80B, additional 64K RAM, CP/M graphics, 300% faster than any other CP/M for Apple. One year warranty

CPX-62810A *A.L.S. CP/M card* _____ **$349.95**

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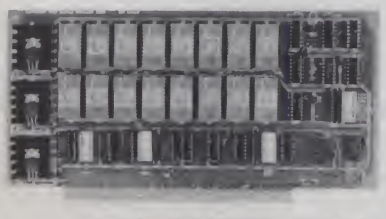
32K S-100 EPROM CARD

PRICE CUT!



$59.95

USES 2716's

Blank PC Board - $34

ASSEMBLED & TESTED ADD $30

SPECIAL: 2716 EPROM's (450 NS) Are $4.95 Ea. With Above Kit.

KIT FEATURES:

1. Uses +5V only 2716 (2Kx8) EPROM's
2. Allows up to 32K of software on line!
3. IEEE S-100 Compatible.
4. Addressable as two independent 16K blocks.
5. Cromemco extended or Northstar bank select
6. On board wait state circuitry if needed
7. Any or all EPROM locations can be disabled
8. Double sided PC board, solder-masked, silk-screened
9. Gold plated contact fingers
10. Unselected EPROM's automatically powered down for low power
11. Fully buffered and bypassed
12. Easy and quick to assemble

64K S100 STATIC RAM

$229.00 KIT

NEW!

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD WITH DOCUMENTATION $55

SUPPORT ICs + CAPS $17.50

FULL SOCKET SET $14.50

FULLY SUPPORTS THE NEW IEEE 696 S100 STANDARD (AS PROPOSED)

FOR 56K KIT $199

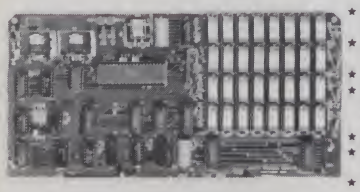
ASSEMBLED AND TESTED ADD $50

FEATURES:

- Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- Fully supports IEEE 696 24 BIT Extended Addressing.
- 64K draws only approximately 500 MA.
- 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- SUPPORTS PHANTOM (BOTH LOWER 32K AND ENTIRE BOARD).
- 2716 EPROMs may be installed in any of top 48K.
- Any of the top 8K (E000 H AND ABOVE) may be disabled to provide windows to eliminate any possible conflicts with your system monitor, disk controller, etc.
- Perfect for small systems since BOTH RAM and EPROM may co-exist on the same board.
- BOARD may be partially populated as 56K.

256K S-100 SOLID STATE DISK SIMULATOR!

WE CALL THIS BOARD THE "LIGHT-SPEED-100" BECAUSE IT OFFERS AN ASTOUNDING INCREASE IN YOUR COMPUTER'S PERFORMANCE WHEN COMPARED TO A MECHANICAL FLOPPY DISK DRIVE.



FEATURES:

- 256K on board, using + 5V 64K DRAMS.
- Uses new Intel 8203-1 LSI Memory Controller.
- Requires only 4 Dip Switch Selectable I/O Ports.
- Runs on 8080 or Z80 S100 machines.
- Up to 8 LS-100 boards can be run together for 2 Meg. of On Line Solid State Disk Storage.
- Provisions for Battery back-up.
- Software to mate the LS-100 to your CP/M* 2.2 DOS is supplied.
- The LS-100 provides an increase in speed of up to 7 to 10 times on Disk intensive Software.
- Compare our price! You could pay up to 3 times as much for similar boards.

BLANK PCB (WITH CP/M* 2.2 PATCHES ON DISK) $69.95

$399.00

#LS-100 (FULL 256K KIT)

64K SS-50 STATIC RAM

$179.00 (48K KIT)

NEW!

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD WITH DOCUMENTATION $52

SUPPORT ICs + CAPS $18.00

FULL SOCKET SET $15.00

56K Kit $219

64K Kit $249

ASSEMBLED AND TESTED ADD $50

FEATURES:

- Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- Fully supports Extended Addressing.
- 64K draws only approximately 500 MA.
- 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- Board is configured as 3-16K blocks and 8-2K blocks (within any 64K block) for maximum flexibility.
- 2716 EPROMs may be installed anywhere on Board.
- Top 16K may be disabled in 2K blocks to avoid any I/O conflicts.
- One Board supports both RAM and EPROM.
- RAM supports 2MHZ operation at no extra charge!
- Board may be partially populated in 16K increments.

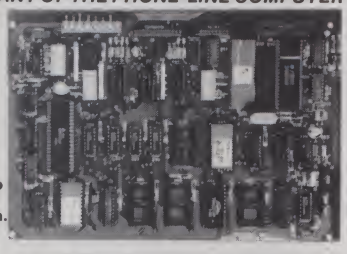
THE NEW ZRT-80

CRT TERMINAL BOARD!

A LOW COST Z-80 BASED SINGLE BOARD THAT ONLY NEEDS AN ASCII KEYBOARD, POWER SUPPLY, AND VIDEO MONITOR TO MAKE A COMPLETE CRT TERMINAL. USE AS A COMPUTER CONSOLE, OR WITH A MODEM FOR USE WITH ANY OF THE PHONE-LINE COMPUTER SERVICES.

FEATURES:

- Uses a Z80A and 6845 CRT Controller for powerful video capabilities.
- RS232 at 16 BAUD Rates from 75 to 19,200.
- 24 x 80 standard format (60 Hz).
- Optional formats from 24 x 80 (50 Hz) to 64 lines x 96 characters (60 Hz).
- Higher density formats require up to 3 additional 2K x 8 6116 RAMS.
- Uses N.S. INS 8250 BAUD Rate Gen. and USART combo IC.
- 3 Terminal Emulation Modes which are Dip Switch selectable. These include the LSI-ADM3A, the Heath H-19, and the Beehive.
- Composite or Split Video.
- Any polarity of video or sync.
- Inverse Video Capability.
- Small Size: 6.5 x 9 inches.



BLANK PCB WITH 2716 CHAR. ROM, 2732 MON. ROM $59.95

SOURCE DISKETTE - ADD $10

SET OF 2 CRYSTALS - ADD $7.50

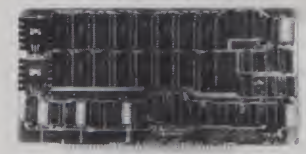
ZRT-80 WITH 8 IN. SOURCE DISK! **$129.95** (COMPLETE KIT, 2K VIDEO RAM)

32K S100 EPROM/STATIC RAM

NEW! FOUR FUNCTION BOARD! **NEW!**

EPROM II FULL EPROM KIT $80.00

A&T EPROM ADD $35.00



BLANK PC BOARD WITH DATA $39.95

SUPPORT IC'S PLUS CAPS $23.00

FULL SOCKET SET $18

We took our very popular 32K S100 EPROM Card and added additional logic to create a more versatile EPROM/RAM Board.

FEATURES:

- This one board can be used in any one of four ways:
  - A. As a 32K 2716 EPROM Board
  - B. As a 32K 2732 EPROM Board (Using Every Other Socket)
  - C. As a mixed 32K 2716 EPROM/2K x 8 RAM Board
  - D. As a 32K Static RAM Board
- Uses New 2K x 8 (TMM2016 or HM6116) RAM's
- Fully Supports IEEE 696 Buss Standard (As Proposed)
- Supports 24 Bit Extended Adressing
- 200 NS (FAST!) RAM'S are standard on the RAM Kit
- Supports both Cromemco and North Star Bank Select
- Supports Phantom
- On Board wait State Generator
- Every 2K Block may be disabled
- Addressed as two separate 16K Blocks on any 64K Boundary
- Perfect for MP/M* Systems
- RAM Kit is very low power (300 MA typical)

32K STATIC RAM KIT — $129.95

For RAM Kit A&T - Add $40

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OEM - INDUSTRIAL - BUSINESS - SCIENTIFIC

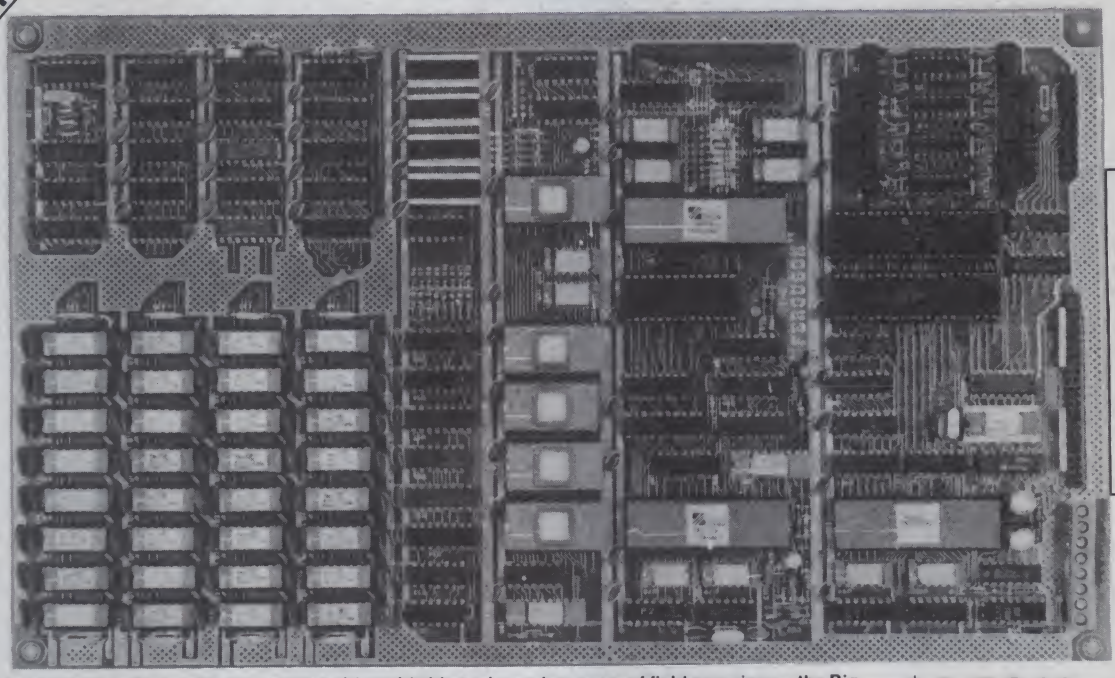
SINGLE BOARD COMPUTER KIT!

Z-80 CPU! 64K RAM!

(DO NOT CONFUSE WITH ANY OF OUR FLATTERING IMITATORS!)

NEW!

PARTIALLY ASSEMBLED KITS For All Sockets Installed And Soldered Add $50. (Not For Blank PCB)



WANT MORE INFO? Full Documentation and Schematics — $5.

THE BIG BOARD PROJECT: With thousands sold worldwide and over two years of field experience, the Big Board may just be one of the most reliable single board computers available today. This is the same design that was licensed by Xerox Corp. as the basis for their 820 computer.

The Big Board gives you the right mix of most needed computing features all on one board. The Big Board was designed from scratch to run the latest version of CP/M*. Just imagine all the off-the-shelf software that can be run on the Big Board without any modifications needed.

$279.00 ** (64K KIT BASIC I/O)

SIZE: 8½ x 13¾ IN.
SAME AS AN 8 IN. DRIVE.
REQUIRES: +5V @ 3 AMPS
+ - 12V @ .5 AMPS.

FULLY SOCKETED!

FEATURES: (Remember, all this on one board!)

64K RAM

Uses Industry standard 4116 RAM's. All 64K is available to the user, our VIDEO and EPROM sections do not make holes in system RAM. Also, very special care was taken in the RAM array PC layout to eliminate potential noise and glitches.

Z-80 CPU

Running at 2.5 MHZ. Handles all 4116 RAM refresh and supports Mode 2 INTERUPTS. Fully buffered and runs 8080 software.

SERIAL I/O (OPTIONAL)

Full 2 channels using the Z80 SIO and the SMC 8116 Baud Rate Generator. FULL RS232! For synchronous or asynchronous communication. In synchronous mode, the clocks can be transmitted or received by a modem. Both channels can be set up for either data-communication or data-terminals. Supports mode 2 Int. Price for all parts and connectors: $39.95

BASIC I/O

Consists of separate parallel port (Z80 PIO) for use with an ASCII encoded keyboard for input. Output would be on the 80 x 24 Video Display.

BLANK PC BOARD — $99.95

The blank Big Board PC Board comes complete with full documentation (including schematics), the character ROM, the PFM 3.3 MONITOR ROM, and a diskette with the source of our BIOS, BOOT, and PFM 3.3 MONITOR.

24 x 80 CHARACTER VIDEO

With a crisp, flicker-free display that looks extremely sharp even on small monitors. Hardware scroll and full cursor control. Composite video or split video and sync. Character set is supplied on a 2716 style ROM, making customized fonts easy. Sync pulses can be any desired length or polarity. Video may be inverted or true. 5 x 7 Matrix - Upper & Lower Case.

FLOPPY DISC CONTROLLER

Uses WD1771 controller chip with a TTL Data Separator for enhanced reliability. IBM 3740 compatible. Supports up to four 8 inch disc drives. Directly compatible with standard Shugart drives such as the SA800 or SA801. Drives can be configured for remote AC off-on. Runs CP/M* 2.2.

TWO PORT PARALLEL I/O (OPTIONAL)

Uses Z-80 PIO. Full 16 bits, fully buffered, bi-directional. Uses selectable hand shake polarity. Set of all parts and connectors for parallel I/O: $19.95

REAL TIME CLOCK (OPTIONAL)

Uses Z-80 CTC. Can be configured as a Counter on Real Time Clock. Set of all parts: $9.95

CP/M* 2.2 FOR BIG BOARD

The popular CP/M* D.O.S. to run on Big Board is available for $139.00.

DOUBLE DENSITY ADAPTER BOARD — $149.95 (A&T)

Requires no cuts or MODS to an existing Big Board. Gives up to 670K storage on a single sided 8 in. diskette. With software to patch your CP/M* 2.2.

PFM 3.3 2K SYSTEM MONITOR

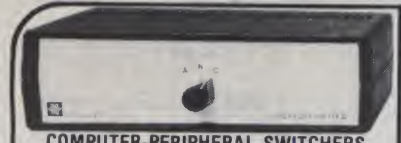
The real power of the Big Board lies in its PFM 3.3 on board monitor. PFM commands include: Dump Memory, Boot CP/M*, Copy, Examine, Fill Memory, Test Memory, Go To, Read and Write I/O Ports, Disc Read (Drive, Track, Sector), and Search PFM occupies one of the four 2716 EPROM locations provided. Z-80 is a Trademark of Zilog.

Digital Research Computers
(OF TEXAS)
P.O. BOX 461565 • GARLAND, TEXAS 75046 • (214) 271-3538

TERMS: Shipments will be made approximately 3 to 6 weeks after we receive your order. VISA, MC, cash accepted. We will accept COD's (for the Big Board only) with a $75 deposit. Balance UPS COD. Add $4.00 shipping.

USA AND CANADA ONLY

*TRADEMARK OF DIGITAL RESEARCH. NOT ASSOCIATED WITH DIGITAL RESEARCH OF CALIFORNIA, THE ORIGINATORS OF CPM SOFTWARE
**1 TO 4 PIECE DOMESTIC USA PRICE.



COMPUTER-PERIPHERAL SWITCHERS

Connect any number of peripherals to a single I/O port — use a single printer to support several microcomputers — use two or more printers to support a single microcomputer — access a modem from any of several microcomputers — ideal for demonstrating or comparing equipment. The Selecto-Switches are designed to eliminate the unnecessary plugging & unplugging of cables which connect printers, tarminals, or modems to various computers. By using a Selecto-Switch, you achieve more efficient system operation, better utilization of peripherals & computer ports, eliminate redundant hardware & reduce service calls. 5 yr. limited warranty on all Selecto-Switches. No power required. Size (inches): 10L x 7W x 3H. 2½ lbs.

RS232 SERIAL SELECTO-SWITCH

• Switches all lines of asynchronous data • Easy expansion of serial ports • Connectors are female DB25 type

PART NO.	DESCRIPTION	PRICE
GRS232-AB	2-Way Switch	$139.95
GRS232-ABC	3-Way Switch	$179.95

DB25 PARALLEL SELECTO-SWITCH

• TRS-80, Apple, and IBM compatible • Switches 24 lines (line 1 is ground) • Connectors are female DB25 type

PART NO.	DESCRIPTION	PRICE
GP24-AB	2-Way Switch	$139.95
GP24-ABC	3-Way Switch	$179.95

CENTRONICS-STYLE SELECTO-SWITCH

• Switches all 36 lines • Connectors are female Centronics

PART NO.	DESCRIPTION	PRICE
GCENT-AB	2-Way Switch	$199.95
GCENT-ABC	3-Way Switch	$229.95

Micro-Logic Corp. MICRO-CHARTS

• Fully decoded data • Instant access • 2-sided, totally comprehensive • Compact 8½ x 11 in. durable credit card plastic • Perfect for programmers & engineers • Clear & concise tables for: full instruction set, disassembly, ASCII, base conversion, effect of flags, compare vs. jump, interrupt structure, pinout, cycle times, diagrams, bug notes, & much more.

PART NO.	REFERENCE	PRICE
ML-Z80	Z80 CPU	$5.95
ML-8080A	8080A/8085A	$5.95
ML-6502	6502 (65XX)	$5.95
ML-8048	8048, Relatives, Algorithms	$5.95
ML-7400	5400/7400 TTL	$5.95

BOOKS

30001	**National CMOS Data Book (1981)** (640 pages) 74C, CD4000, and A/D Converters	$6.95
30003	**National Linear Data Book (1982)** (1376 pages) LM, LF, ADC, DAC, LH Series	$11.95
30008	**National Memory Data Book (1980)** (464 pages) RAMs, ROMs, PROMs, EPROMs Series	$6.95
30009	**Intersil Data Book (1983)** (1356 pages) Complete line.	$9.95
30010	**National Audio/Radio Handbook (1980)** (240 pages) Pre-Amps, AM, FM & FM Stereo, Power Amps	$5.95
30011	**National Linear Application Handbook (1980)** (736 pages) Application Notes, Linear Briefs, etc.	$15.95
30012	**National PAL Data Book (1982)** (176 pages) Application Notes, Linear Briefs, etc.	$5.95
30013	**Zilog Data Book (1983)** (641 pages) Microprocessors and Support Chips	$7.95
210830	**Intel Memory Components Handbook (1983)** (796 pages) Contains all Application Notes, Article Reprints, Data Sheets, and other design information on Intel's RAMs, EPROMs, EPROMs & Bubble Memories.	$14.95
210844	**Intel Microprocessor & Peripheral Handbook (1983)** (1027 pages) Contains Data Sheets on all of Intel's Microprocessors and Peripherals.	$14.95

ATARI

ATARI PADDLES

JSP (2) . . . . . $2.95 pair

ATARI DRIVER

JSD(1) . . . . . $2.95 ea.

TV GAME SWITCH

Used on Atari. Cosmetically blemished. 100% functional.

TGS-1 . . . $1.95 ea.

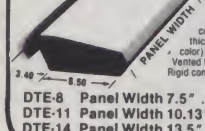
Jameco ELECTRONICS

Digital Thermometer Kit

Dual sensors — switch controls for indoor/outdoor or dual monitoring — can be extended to 500 feet. Continuous LED .6" ht. display. Range: -40°F to 199°F, -40°C to 100°C. Accuracy ±1° nominal. Calibrate for Fahrenheit/Celsius. Simulated walnut case. AC wall adapter included. Size: 6⅝"L x 3¼"H x 1⅞"D.

JE300 . . . . . $39.95

Universal Computer Keyboard Enclosures



"OTE" Blank Desk-Top Enclosures are designed for easy modification. High strength epoxy molded and pieces in mocha brown finish. Sliding rear/bottom panel for service/component access. Top/bott panels .080" thick alum. alodine type 1200 finish (gold tint color) for best paint adhesion after modification. Vented top & bottom panels for cooling efficiency. Rigid construction provides unlimited applications. Assembly instructions included.

DTE-8	Panel Width 7.5"	$24.95
DTE-11	Panel Width 10.13"	$27.95
DTE-14	Panel Width 13.5"	$29.95
DTE-20	Panel Width 19.25"	$34.95

5¼" HALF-HEIGHT DISK DRIVES

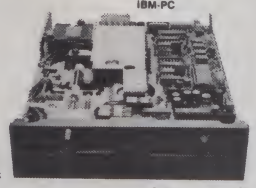
FIT TWO DRIVES IN THE SAME SPACE AS ONE CONVENTIONAL 5¼" DRIVE

TEAC FD55A

COMPATIBLE WITH TRS-80 IBM-PC

SINGLE-SIDED:
- 48 tpi
- 40 Tracks
- 250Kbytes single-sided
- Single/double density
- Brushless DC direct-drive motor
- Low 5W power consumption
- Power req.: +12VDC @ .3A +5VDC @ .55A
- 6 msec. track to track
- One year warranty
- Size: 5¾"W × 1¾"H × 8"D
- Weight: 3 lbs. 5 oz.

FD55A $249.95



SHUGART SA455

DOUBLE-SIDED:
- 48 tpi
- 40 Tracks
- 500Kbytes double-sided
- Single/double density
- Brushless DC direct-drive motor
- Power req.: +12VDC @ .75A +5VDC @ .7A
- 6 msec. track to track
- Compatible with SA400/450
- One year warranty
- Size: 5.75"W × 1.63"H × 8"D
- Weight: 3.3 lbs.

Shugart SA455

SA455 . . . . . $259.95

Keyboard Mask for Your ZX81/1000* Computer

FEATURES:
- Install in seconds. Remove adhesive backing from mask and place over keyboard.
- All characters and symbols reproduced on mask.
- Durable — formed with poly carbonate sheet satin finish.

JE681 KEYBOARD MASK

The JE681 Keyboard Mask provides users of the ZX81/1000 series computer the individual feel of each keypad on the keyboard. The mask has a raised outline around each keypad allowing the user to feel and correctly position their fingers onto the keyboard.

JE681 KEYBOARD MASK . . . . $9.95 each

Jameco ELECTRONICS — ZX81/1000* Keyboard Conversion Kit

JE682-AK KEYBOARD KIT MOUNTED IN DTE-AK ENCLOSURE. LIGHT TAN PANELS WITH MOLDED DARK BROWN END PIECES. SIZE 14¼"W x 3½"D x 3½"H

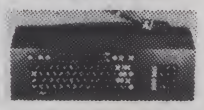
The JE682 Kit provides users of the ZX81/1000 series computers a full-size industrial keyboard hook-up to their computer. The JE682 Kit allows the use of either the full-size keyboard or the Sinclair/Timex Keyboard. The Kit also permits the simple disconnection of the Sinclair/Timex Keyboard for portable use. The JE682 Kit consists of: a full size industrial grade keyboard with 62 keys, 2 p.c. boards, 24" ribbon cable, DIP socket and 4 rubber feet. The keyboard conversion kit can easily be mounted into the DTE-AK enclosure. This enclosure is large enough to contain the ZX81/1000 computer and the full-size keyboard together. A handy label representing the ZX81/1000 keyboard layout is placed on the enclosure.

JE682-AK Keyboard Conversion Kit (WITH DTE-AK CASE - AS PICTURED) . . . . $99.95 ea.

JE682 Keyboard Conversion Kit (WITHOUT DTE-AK CASE) . . . . $59.95 ea.

*ZX81/1000 is a trademark of Sinclair/Timex

80-Key Keyboard



CA150C $69.95

95-Key Keyboard

CA154A $79.95

CONTROL DATA KEYBOARDS

- ★ 7-bit Parallel ASCII
- ★ SPST Switching
- ★ FTZ Shielded Base
- ★ N-Key Rollover
- ★ 128 Character ASCII
- ★ Non-Slip, Non-Glare Keycaps
- ★ CDC752 Terminal Keyboards
- ★ Attractive Case

Limited Quantities!

These Control Data Keyboards consist of a base, cover, the keyboard assembly, and an interface cable. Color (case): Harvest gold and black. Color (keycaps): Black, blue, and red. Electrical requirements: +5V @ 600mA, -12V @ 50mA. Size: 21½"W x 9"D x 3½"H. Weight: 6 lbs. All units brand new in original boxes, specifications included.

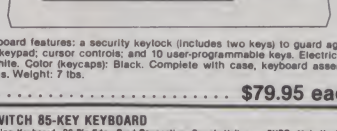
Keytronics 90-Key Soft-Programmable Keyboard

WITH SECURITY KEYLOCK SWITCH

Also Available!

BRAND NEW!!

- RFI shielded
- Cursor controls
- Numeric keypad
- 8-bit Parallel
- Solid state switches
- 10 user-programmable keys
- Positive TTL Logic
- Size: 17"L x 8¼"W x 2¾"H



Made for Visual Technology, this keyboard features: a security keylock (includes two keys) to guard against unauthorized use; an 11-key numeric keypad; cursor controls; and 10 user-programmable keys. Electrical requirements: +5VDC. Color (case): White. Color (keycaps): Black. Complete with case, keyboard assembly, 40-inch interface cable, and schematics. Weight: 7 lbs.

Part No. KB270 . . . . . $79.95 each

23"Lx5¼"Wx1-3/8"H

MICRO SWITCH 85-KEY KEYBOARD
Word Processing Keyboard, 26 Pin Edge Card Connection. Supply Voltage +5VDC. Main Keyboard is QWERTY. Additional Key Pads for Cursor and word processing functions.
Part No. 85SD18-1 . . . . $29.95 each

3"L x 3"W x 1½"H

HI-TEK 14-KEY NUMERIC KEYPAD
SPST switching. Charcoal grey keycaps. Mounted on printed circuit board.
Part No. K-14 . . . . $9.95 each

POWER SUPPLY +5VDC @ 1 AMP REGULATED — Transaction Tech
Output +5VDC @ 1A (also +30VDC) reg. Input 115VAC 60Hz. 2-tone (black/beige) self-enclosed case. 6 ft., 3 cond. black power cord. 6½"W x 7"D x 2¾"H. Wt. 3 lbs. Data sheet incl.
Part No. PS51194S . . . . $14.95 each

POWER SUPPLY +5VDC @ 3 AMP REGULATED — Deltron
Input: 115VAC, 47-440Hz. Output: 5VDC Adjustable @ 3 amp, 6VDC @ 2.5 amp. Adjustable current limit, Ripple & Noise: 1MV rms, 5MV p-p — 2 mounting surfaces. UL recognized. Size: 4"W x 4½"L x 2-7/16"H - wt. 2 lbs. Data sheet included.
Part No. OPS-1 . . . . $29.95 each

POWER SUPPLY +5VDC @ 7.5 AMP, 12VDC @ 1.5 AMP SWITCHING
Input: 115VAC, 50-60Hz @ 3 amp/230VAC, 50Hz @ 1.6 amp. Fan volt./power supply select switches (115/230VAC). Output: 5VDC @ 7.6 amp, 12VDC @ 1.6 amp. 6 ft. blk. pwr. cord. 11½"W x 13¼"D x 3¾"H. Wt. 6 lbs.
Part No. PS94V0S . . . . $39.95 each

POWER SUPPLY 4-Channel Switching - Apple Compatible
FOR USE AS AN EXTERNAL POWER SUPPLY FOR APPLE
Microprocessor, mini-computer, terminal, medical equipment and process control applications. Input: 90-130VAC 47-440Hz. Output: +5VDC @ 5A, -5VDC @ 1A, +12VDC @ 1A, -12VDC @ 1A. Line reg.: ± 0.2%. Ripple: 30mV p-p. Load reg.: ± 1%. Overcurrent protection. Adj. 5V main output: 10%. 6-3/8"L x 1-7/8"W x 4-15/16"H. Wt. 1½ lbs.
Part No. FCS-604A . . . . $69.95 each

$10.00 Minimum Order — U.S. Funds Only
California Residents Add 6½% Sales Tax
Shipping — Add 5% plus $1.50 Insurance
Send S.A.S.E. for Monthly Sales Flyer!

Spec Sheets — 30¢ each
Send $1.00 Postage for your *FREE 1983 JAMECO CATALOG*
Prices Subject to Change

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Jameco ELECTRONICS

VISA®

1355 SHOREWAY ROAD, BELMONT, CA 94002

9/83 *PHONE ORDERS WELCOME — (415) 592-8097 Telex: 176043*

JE664 EPROM PROGRAMMER

8K TO 64K EPROMS — 24 AND 28 PIN PACKAGES

— PROGRAMS 2716's IN 16 SECONDS —
— PROGRAMS 2764's IN 64 SECONDS —

• Programs, validates, and checks for properly erased EPROMs • Emulates PROMs or EPROMs • RS232C Computer Interface for editing / program loading • Loads data into RAM by keyboard • Changes data in RAM by keyboard • Loads RAM from an EPROM • Compares EPROMs for content differences • Copies EPROMs • Power Input: 115VAC, 60Hz. ◄ 1DW power consumption • Enclosure: Color-coordinated, light tan panels w / moldad mocha brown end pieces • Size: 15-5/8"L × 8¾"D × 3½"H • Weight: 5¾ lbs.

JE664-A EPROM Programmer $995.00
Assembled & Tested (Includes JM16A Module)

JE665 — RS232C INTERFACE OPTION — The JE665 RS232C Interface Option implements computer access to the JE664's RAM. Sample software written in BASIC provided for TRS-80® Model I, Level II Computer. Baud rate: 9600. Word lgth. 8 bits- odd parity. Stop bits: 2. Option may be adapted to other computers. The JE665 can be interfaced to any computer with an RS232 port. Information is also provided for interfacing to any CP/M system with an RS232 port.

JE664-ARS EPROM Prog. w / JE665 Option $1195.00
Assembled and Tested (Includes JM16A Module)

EPROM JUMPER MODULES — The JE664's JUMPER MODULE (Personality Module) is a plug-in Module that pre-sets JE664 for proper programming pulses to the EPROM & configures EPROM socket connections for that particular EPROM.

P/N	EPROM	EPROM MANUFACTURER	PRICE
JM08A	2708	AMD, Motorola, National, Intel, TI	$14.95
JM16A	2716,TMS2516	Intel, Motorola, National, NEC, TI	$14.95
JM16B	TMS2716	Motorola, TI (+5, -12, +12)	$14.95
JM32A	TMS2532	Motorola, TI	$14.95
JM32B	2732	AMD, Fujitsu, NEC, Hitachi, Intel	$14.95
JM32C	2732A (21V)	Fujitsu, Intel	$14.95
JM64A	MCM68764, MCM68L764	Motorola	$14.95
JM64B	2764	Intel	$14.95
JM64C	TMS2564	TI	$14.95
JM64O	HN482764G-4	Hitachi (21V)	$14.95

iii's Black Hole EPROM Eraser

9 Chips — 6 Minutes

The Black Hole EPROM Eraser will completely and safely erase 9 EPROMs in less than 8 minutes. The Black Hole is a fully automatic cassette loading eraser featuring U-shaped 4000 hr. UV lamps mounted in a special ALZAK (UV reflectivity of .9) parabolic light tunnel. In operation, the user slips in an anti-static Bug Box (3 ea. incl.) containing the EPROMs to be erased into the loading slot on the front panel of Black Hole. The rest is fully automatic. The Black Hole latches the Bug Box into place, turns on the UV lamps and starts its fully solid state (CMOS) UV integration dose timer. The percentage erasure time is monitored and displayed on a front panel LED readout. At the end of the erase cycle, the Black Hole ejects the Bug Box containing the 9 erased EPROMs and turns off power.

PART NO.		PRICE
ULV-008	Replacement Lamp for ERS-008	$29.95
ERS-008	Eraser, Auto Eject & LED Readout	$249.95

IBM MEMORY EXPANSION KIT

SAVE HUNDREDS OF $$$ BY UPGRADING MEMORY BOARDS YOURSELF!

Most of the popular memory boards allow you to add an additional 64K, 128K, 192K, or 256K. The IBM64K Kit will populate these boards in 64K byte increments. The kit is simple to install — just insert the nine 64K RAM chips in the provided sockets and set the two groups of switches. Directions are included.

IBM64K (Nine 200ns 64K RAMs) $59.95

EXPAND YOUR MEMORY

TRS-80 to 16K, 32K, or 48K

**Model 1 =	From 4K to 16K Requires (1) One Kit
Model 3 =	From 4K to 48K Requires (3) Three Kits
Color =	From 4K to 16K Requires (1) One Kit

**Model 1 equipped with Expansion Board up to 48K Two Kits Required — One Kit Required for each 16K of Expansion —

TRS-16K3 *200ns for Color & Model III $12.95
TRS-16K4 *250ns for Model I $10.95

TRS-80 Color 32K or 64K Conversion Kit

Easy to install kit comes complete with 8 ea. 4164-2 (200ns) 64K dynamic RAMs & conversion documentation. Converts TRS-80 color computers with E circuit boards, & all new color computers to 32K. Minor modifications of 32K memory will allow the use of all the 64K of the dynamic RAM providing you have a FLEX DOS operating system.

TRS-64K2 . . . . $54.95

5¼" Mini-Floppy Disk Drive

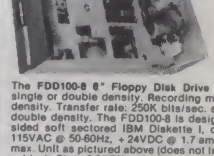
FOR TRS-80 MODEL I - COLOR COMPUTER

Pertec Computer Corp.

Features single or double density. Recording mode: FM single, MFM double density. Seek time: 25msec. track to track. Power: +12VDC (±0.6V) 1.6A max., +5VDC (±0.25V) 0.8A max. Unit as pic. at right does not incl. cable, power supply, cables) 30-pg. data book incl. Wt. 3½ lbs. Size: 5¾"W x 8"D x 3¾"H.

Part No.	*Limited Quantity!*	Price
FD200	Single-sided, 40 tracks, 250K bytes capacity	$179.95
FD250	Double-sided, 35 tracks, 438K bytes capacity	$199.95

8" FLOPPY DISK DRIVE



- Shugart 801R compatible
- Single-Sided
- 77 Tracks
- 400/800K Bytes Capacity
- Industry Standard

The FDD100-8 8" Floppy Disk Drive (Industry Standard) features single or double density. Recording mode: FM single, MFM double density. Transfer rate: 250K bits/sec. single density; 500K bits/sec. double density. The FDD100-8 is designed to work with the single-sided soft sectored IBM Diskette I, or eq. disk cartridge. Power: 115VAC @ 50-60Hz, + 24VDC @ 1.7 amps max., +5VDC @ 1.2 amps max. Unit as pictured above (does not include case, power supply, or cables). Size: 8.55"W x 14"L x 4.5"H. Weighs 12 lbs. Incl. 96-pg. manual.

Part No.	Price
FDD100-8 . .	$169.95 ea.

READER SERVICE

This card valid until October 31, 1983

My vote for the best advertisement in this issue goes to_____(company) whose Reader Service number is_____.

A. Which microcomputing systems do you own? Check all that apply.

☐1. Apple II, II +, III
☐2. Apple IIe
☐3. Atari 400, 800
☐4. Atari 1200 XL
☐5. Commodore VIC-20
☐6. Commodore-64
☐7. Commodore/PET
☐8. Cromemco
☐9. DEC
☐10. Franklin Ace
☐11. Heath/Zenith
☐12. Hewlett-Packard
☐13. IBM PC
☐14. Kaypro
☐15. NEC
☐16. North Star
☐17. Osborne
☐18. PMC 80/81
☐19. S-100 based system
☐20. Sanyo
☐21. Texas Instruments
☐22. Timex/Sinclair
☐23. TRS-80
☐24. Xerox
☐25. Other_____

Which of the following systems do you plan to buy during the next 12 months?

☐26. Apple Lisa
☐27. Apple IIe
☐28. Atari 1200 XL
☐29. Commodore-64
☐30. Compaq
☐31. Epson HX-20
☐32. Epson QX-10
☐33. Franklin Ace
☐34. Hyperion
☐35. IBM XT PC
☐36. Morrow Micro Decision
☐37. North Star Advantage
☐38. Osborne Executive
☐39. Otrona Attache
☐40. Panasonic JR-200
☐41. Sony SMC 70
☐42. Texas Instruments Compact
☐43. Texas Instruments Professional
☐44. Timex/Sinclair 2000
☐45. TRS-80 Model 12
☐46. TRS-80 Model 16
☐47. Tandy Model 100
☐48. Zenith 100
☐49. Zorba
☐50. Other_____

B. How much have you invested in computer hardware (including peripherals) during the last 12 months?

☐1. Nothing
☐2. Under $500
☐3. $500–$1,000
☐4. $1,000–$1,500
☐5. $1,500–$2,000
☐6. Over $2,000

C. How much do you plan to spend on computer hardware during the next 12 months?

☐1. Nothing
☐2. Under $500
☐3. $500–$1,000
☐4. $1,000–$1,500
☐5. $1,500–$2,000
☐6. Over $2,000

D. How much have you invested in computer software during the last 12 months?

☐1. Nothing
☐2. Less than $100
☐3. $100–$250
☐4. $250–$500
☐5. $500–$1,000
☐6. Over $1,000

E. How much do you plan to spend on software during the next 12 months?

☐1. Nothing
☐2. Less than $100
☐3. $100–$250
☐4. $250–$500
☐5. $500–$1,000
☐6. Over $1,000

F. Do you influence friends or business associates' purchases of computing equipment?

☐1. Yes ☐2. No

G. What do you consider the *best* source of information about computers? Check one only.

☐1. Computer magazines
☐2. Other magazines
☐3. Newspapers
☐4. Books
☐5. Seminars/courses
☐6. Word of mouth
☐7. Other_____

H. If you use a microcomputer at work, what is your primary application?

☐1. Word Processing
☐2. Database Management
☐3. Other Business
☐4. Home Finance/Household
☐5. Education
☐6. Scientific/Technical
☐7. Programming/Data Processing
☐8. Hardware Design
☐9. Graphics
☐10. Other_____

I. For the most part, the articles in *Microcomputing* are

☐1. Too simple
☐2. Too complex
☐3. Just right

L. Which of the following columns do you read? Please rate them on a scale of 1 (seldom read) to 5 (always read).

___1. Publisher's Remarks
___2. What's New, Big Blue?
___3. Dial-up Directory
___4. PET-pourri
___5. Micro Software Digest
___6. Conversions
___7. Book Reviews
___8. New Software
___9. New Products
___10. Software Reviews

M. If you are not a subscriber, please circle 500.

Reader Service: Return this card to receive full information on the products advertised in this issue. Refer to the ad. You will find numbers near the logo of each advertiser. Each represents the advertiser's individual Reader Service number. Circle the corresponding numbers on one of the cards on this page, include your name, address & zip, and drop in a mailbox. In 4–6 weeks you'll hear from the advertiser directly.

1	6	11	16	21	126	131	136	141	146	251	256	261	266	271	376	381	386	391	396
2	7	12	17	22	127	132	137	142	147	252	257	262	267	272	377	382	387	392	397
3	8	13	18	23	128	133	138	143	148	253	258	263	268	273	378	383	388	393	398
4	9	14	19	24	129	134	139	144	149	254	259	264	269	274	379	384	389	394	399
5	10	15	20	25	130	135	140	145	150	255	260	265	270	275	380	385	390	395	400
26	31	36	41	46	151	156	161	166	171	276	281	286	291	296	401	406	411	416	421
27	32	37	42	47	152	157	162	167	172	277	282	287	292	297	402	407	412	417	422
28	33	38	43	48	153	158	163	168	173	278	283	288	293	298	403	408	413	418	423
29	34	39	44	49	154	159	164	169	174	279	284	289	294	299	404	409	414	419	424
30	35	40	45	50	155	160	165	170	175	280	285	290	295	300	405	410	415	420	425
51	56	61	66	71	176	181	186	191	196	301	306	311	316	321	426	431	436	441	446
52	57	62	67	72	177	182	187	192	197	302	307	312	317	322	427	432	437	442	447
53	58	63	68	73	178	183	188	193	198	303	308	313	318	323	428	433	438	443	448
54	59	64	69	74	179	184	189	194	199	304	309	314	319	324	429	434	439	444	449
55	60	65	70	75	180	185	190	195	200	305	310	315	320	325	430	435	440	445	450
76	81	86	91	96	201	206	211	216	221	326	331	336	341	346	451	456	461	466	471
77	82	87	92	97	202	207	212	217	222	327	332	337	342	347	452	457	462	467	472
78	83	88	93	98	203	208	213	218	223	328	333	338	343	348	453	458	463	468	473
79	84	89	94	99	204	209	214	219	224	329	334	339	344	349	454	459	464	469	474
80	85	90	95	100	205	210	215	220	225	330	335	340	345	350	455	460	465	470	475
101	106	111	116	121	226	231	236	241	246	351	356	361	366	371	476	481	486	491	496
102	107	112	117	122	227	232	237	242	247	352	357	362	367	372	477	482	487	492	497
103	108	113	118	123	228	233	238	243	248	353	358	363	368	373	478	483	488	493	498
104	109	114	119	124	229	234	239	244	249	354	359	364	369	374	479	484	489	494	499
105	110	115	120	125	230	235	240	245	250	355	360	365	370	375	480	485	490	495	500

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Reader Service Number		Page
273	ABC Data Products	47
401	Acquis Data, Inc.	98
109	Alcor Systems	CIII
468	Allen Systems	134
487	Alphacom, Inc.	141
492	Amdek Corp.	140
481	Anadex	139
94	Analytical Processes Corp.	18
193	Apple Computer	74, 75
76	Apropos Technology	40
493	Axiom Corporation	140
26	BG Computer Applications	47
131	Bay Technical Assoc., Inc.	82
462	Business Planning Systems	136
396	Bytek Computer Systems	39
365	Bytesize Computer Products	96
298	Bytesize Computer Products	97
344	Bytewriter	65
148	CDR Systems, Inc.	72
283	CGRS Microtech	41
262	Cab-Tek, Inc.	49
369	Cardco, Inc.	5
275	Cer-Tek	104
170	Chips & Dale	79
121	Compucable	19
90	Compucover	77
484	Compuscope	139
*	Computer Continuum	77
18	Computer Design Labs	33
120	Computer Discount of America	27
460	Computer Dynamics	134
185	Computer Friends	79
489	Computershop, Inc	139
36	Computer Shopper	101
57	Computing!	61
49	Compuview Products, Inc.	89
297	Concord Computer Products	120
47	Control Data	7
197	Cornucopia Software	49
252	*Cuesta Systems*	101
293	D & N Micro Products	43
24	Data Systems	101
*	Digital Research Computers	112, 113
250	Discount Software	67
392	Diskette Connection	51
411	Don't Ask Software	99
60	Eastern House Software	129
471	8th Dimension Enterprises	134
465	Einstein Corp.	136
169	Elcomp Publishing, Inc.	29
93	Electronic Specialist	55
111	Estes Engineering	78
78	Expotek	48
230	Far West Systems & Software	55
206	Fort Worth Computers	49
299	Franklin Computer	9
370	Franklin Computer	11
331	Franklin Computer	13
480	Franklin Computer	138
84	Gateway Maximizer	97
486	Gladstone Electronics	141
17	Gloucester Computer, Inc.	145
461	Golden Braid Software	134
342	Grandma's Software	101
261	GTEK Corp.	59
236	Heath Co.	131
116	Heritage	26
251	Holmes Engineering	14
394	Howard W. Sams & Co.	25
130	ISE/Micro Data Base Systems	81
67	Innovative Data	72
463	Innovative Software, Inc.	134
67	Innovative Data Technology	72
128	Innovative Technology	101
	Instant Software, Inc.	
187	Disk Library	129
186	DOS Customizer	127
118	English Olympics	68
345	International Software Alliance	59
92	JPC Products Co.	143
*	JRT Systems/Blue Earth	21
134	JV Software	107
48	Jade Computer Products	110, 111
41	Jameco Electronics	114
193	Jaxon	219
246	Johnson & Johnson	38
288	Keystone Info. Products	101
5	Kisko	103
355	Leading Edge Products, Inc.	CIV
405	Learning Company, The	100
300	Link-Up Magazine	73
198	LNW Research Corp.	55
373	Logical Devices, Inc.	143
204	Lyben Computer Systems	101
165	Lyben Computer Systems	104
475	(M)agreeable Software, Inc.	137
482	Mannesmann Talley Corp.	138
115	Mechanix Illustrated	26
325	Mega Byte	42
382	Memorex	17
*	Memotech Corp.	71
316	MFJ Enterprises	103
404	Micro Applications Group	100
466	Micro Architect, Inc.	136
239	Micro Craft Corp.	CII
417	Micro Fun	99
*	Micro Logic	96
329	Micro Management Systems	42
474	Micro-Tax	134
*	**Microcomputing**	
	*Foreign Dealers	145
	*Hero	135
	*Microcomputing Subscription Ad	35
	*Reader Service Card	145
	*Run	20
	*Subscription Problems	145
	*Xmas Ad	59
259	Micromate Accessories	103
483	Microperipheral Corp.	140
409	MicroProse	99
491	Microtek, Inc.	139
235	Midwest Micro, Inc.	39
51	Midwest Software	42
408	Monarch Data Systems	100
*	NRI Schools	23
*	Netronics R & D, Ltd.	79
55	New England Business Systems	51
419	Oasis Systems	98
410	Optimized Systems Software	99
488	Orange Micro, Inc.	138
420	PCsoftware	98
172	Pacific Exchanges	97, 104
212	Pacifica Technology	62
85	Percom	3
266	Perry Computers	105
108	Personalized Computer Paper	106
469	Polytron Corp.	134
277	Priority One Electronics	118, 119
485	Pronto Computers, Inc.	141
233	Protecto	77
366	RKS	105
402	Redox Software	98
123	SLR Systems	105
156	Safeware	107
403	Sawhney Software	98
383	Schoolmaster Programming Co.	106
43	Scientific American	53
205	Selectronics	109
359	Simpliway Products Co.	106
14	Sintec	34
132	Sixty Eight Micro Journal	107
416	Soft Images	100
421	Software 1040	98
412	Solarsoft, Inc.	100
167	Solutions, Inc.	108
406	Southwestern Data Systems	99
413	Southwestern Data Systems	99
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361	Star Micronics, Inc.	15
467	Star Software Systems	136
313	Starware	14
244	Sun Research, Inc.	143
39	Sunlock Systems	39
418	Syntauri Corp.	99
318	TNW Corp.	46
189	Tab Sales	32
339	Techstar, Inc.	103
260	Thoughtware, Inc.	83
494	Trak Microcomputer Corp.	138
203	U.S. Digital Corp.	123
53	Upwego	127
470	United Software Associates, Inc.	136
473	Vertex Systems	137
*	**Wayne Green, Inc.**	
	*Binders	145
	* Book Nook 1	116
	* Book Nook 2	117
	* Nanos Cards	63
	* Selectric Interface	137
	* Wayne Green Books	57, 127, 133
472	Webber Software	136
414	Xerox Education Publications	99
311	York 10 Computerware	45

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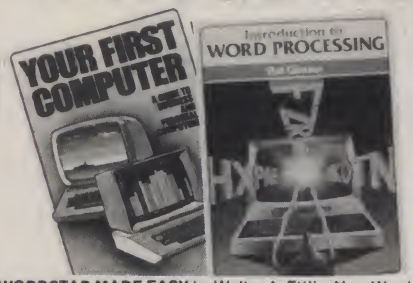

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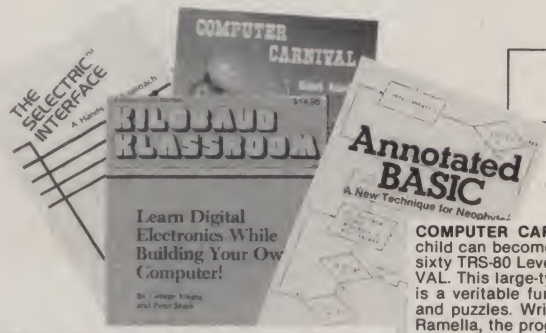

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68000/6809

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CLUB NOTES

68000 User's Group—California

A 68000 Software User's Group is forming in Encinitas. Anyone interested in participating in this group should contact Carl Cagan, 211 N. El Camino Real, Suite 101C, Encinitas, CA 92024; 619-942-0744.

CP/M Group—Connecticut

The Connecticut CP/M User's Group holds nontechnical meetings for business and professional people on the last Monday of each month at 7 p.m. in the McCook Auditorium at Trinity College in Hartford.

For more information, contact Malcolm Roth, 62 Burnwood Drive, Bloomfield, CT 06002; 203-243-3063.

Boston Computer Society

The Boston Computer Society, which contains many special systems groups, publishes a monthly guide to meetings and events. The editor is Mary E. McCann.

Inquiries about the Society and its activities should be addressed to The Boston Computer Society, Three Center Plaza, Boston, MA 02108; 617-367-8080.

IBM PC Group—Winnipeg

The IBM PC User's Group of Winnipeg normally meets the third Thursday evening of the month. Two free copies of the newsletter are sent to prospective members on application.

For details, write IBM PC User's Group of Winnipeg, c/o Business Development International, PO Box 5, Station A, Winnipeg, Manitoba, Canada R3K 1Z9.

New Jersey Amateur Group

The Amateur Computer Group of New Jersey publishes the monthly newsletter ACG-NJ and maintains a newsletter exchange program with other computer clubs. ACG-NJ is an umbrella for many specific systems user's groups in and around Union and Middlesex Counties.

For information and membership applications, write Amateur Computer Group of New Jersey, PO Box 319, South Bound Brook, NJ 08880.

Aloha 20/64 HAWAII

20/64 HAWAII is the name of a new Commodore 64 and VIC-20 club. The group is nonprofit and has no connection with any computer outlet.

The club's focus is on educational aspects and stresses family participation. It hopes eventually to offer a wide variety of educational public domain software. Address all inquiries to the Secretary, Wes Goodpaster, 20/64 HAWAII, PO Box 966, Kailua, HI 96734.

Connecticut Micro Decision Group

The Connecticut Micro Decision User's Group (CMDUG) has recently been formed for anyone using or interested in the Micro Decision computer.

Meetings are held the second Wednesday evening of each month; a quarterly newsletter will be included with membership. For details, write CMDUG, attention: Dave Mintie, c/o MBS Computer Systems, 266 Boston Post Road, Orange, CT 06477.

Commodore Group In Houston

The Commodore Houston User's Group (CHUG) normally meets each month on the University of Houston campus. A newsletter, Hardcopy, comes with a membership costing $18 ($10 for students).

For more information, contact John Walker, president and Hardcopy editor, 8738 Wildforest, Houston, TX 77088; 713-999-3650.

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Two sizes of ads are available. The $5 box allows up to 5 lines of about 35 characters per line, including spaces and punctuation. The $10 box allows up to 10 lines. Minimize use of capital letters to save space. No special layouts allowed. Payment is required in advance with ad copy. We cannot bill or accept credit.

Advertising text and payment must reach us 60 days in advance of publication (i.e., copy for March issue, mailed in February, must be here by Jan. 1). The publisher reserves the right to refuse questionable or inapplicable advertisements. Mail copy with payment to **Classifieds, *Microcomputing*, Peterborough, NH 03458**. Do not include any other material with your ad as it may be delayed.

Kilobaud Microcomputing: Complete set, #1 to # 78 (June '83). $150; I ship. Rick Racine, 2520 S.E. Alexander, Topeka, KS 66605; 913-234-2707.

For Sale: Micro Term ACT-IVa, $275; Sanyo 15" b/w video monitor, $150; Zenith Z-19A terminal, $470; Sinclair ZX81, $28; DEC MSV11-DD (64K byte Q-bus dual height ram board), $250; DEC DLV11J (Q-bus 4 serial line board), w/cables, $320; Vadic 3400 modem, 1200 baud, full duplex, $395. All perfect. 516-686-7890; 516-626-3919.

Used Heath H-8, S-100 BUS, and Wang Laboratories computer for sale. Memory board, I/O card, terminal, disk drive, software and complete system. Ten to 50 percent off list price. Send for free listing. D. Wong, Box 406, Croton Falls, NY 10519.

For Sale: Sanders Printers: 2 Media 12/7 printers. Good condition. Used very little. Tractor & sheet feeders, $1,800 ea. as is, or $2,000 ea. with factory tune up. Bill Kennedy. 217-287-7231. PO Box 38, Taylorville, IL 62568.

CALENDAR

Sunbelt Expo—Phoenix

The third annual Sunbelt Computer Expo will be held September 8–11 at the Civic Plaza in Phoenix, AZ. Featured will be hardware, software and peripherals of interest to all sectors of the public.

There will be over 100 seminars and also continuous hands-on workshops sponsored by Atari and Radio Shack. For further information, contact Judco Computer Expos, 800-528-2355 or, from inside Arizona, 602-990-1715.

Australian Computer Conference

The tenth Australian Computer Conference is scheduled for September 12–15 in Melbourne, Victoria. The conference will deal in depth with virtually every area of computer application and management.

For details, write Professor A.Y. Montgomery, 10 ACC, PO Box 4063, Mail Exchange Melbourne, Victoria, 3001 Australia; telephone (03) 41 6220.

Peripherals '83—San Francisco

The exhibition Peripherals '83 has been re-scheduled from Boston to San Francisco, and will be held September 13–15 in the Moscone Center.

Information can be obtained from Cahners Exposition Group, Cahners Plaza, 1350 E. Touhy Ave., PO Box 5060, Des Plaines, IL 60018; 312-299-9311.

Software Show—Chicago

SOFTWARE/expo, an exhibit and conference for packaged software, will be held September 13–15 at McCormick Place in Chicago. For further information, contact Mark Weber, Professional Exposition Management Co., Inc., Suite 205, 2400 East Devon Ave., Des Plaines, IL 60018; 800-323-5155 or, from Illinois, 312-299-3131.

ICC—Newton, Massachusetts

The 1983/84 series of the Invitational Computer Conference (ICC) begins on September 13 at the Marriott Hotel in Newton, MA. The ICCs are one-day regional conferences directed to a select audience of volume buyers. The conferences feature displays of operating equipment, and technical seminars are held.

Attendance is by invitation. If interested, write or call Susan Fitzgerald, the Conference Manager, at B.J. Johnson & Associates, 3151 Airway Ave., #C-2, Costa Mesa, CA 92626; 714-957-0171.

Mini/Micro-Midwest—Illinois

The Midwest edition of Mini/Micro will take place September 13–15 in connection with Midcon/83 at the O'Hare Exposition Center in Rosemont, IL.

For further information, call Jerry Fossler, 213-772-2965.

Federal Computer Conference—DC

The sixth annual Federal Computer Conference will take place September 13–15 in the Washington Convention Center, Washington, DC. In addition to the program of presentations and workshops, there will be a large exposition of ADP equipment, systems and services on the second and third days.

For more information, contact Federal Education Programs, PO Box 368, Wayland, MA 01778; 800-225-5926 from outside Massachusetts; 617-358-5181 from within Massachusetts.

Euromicro 83—Madrid

Euromicro 83, the ninth annual symposium on microprocessing and microprogramming, will take place in Madrid on September 14–16. The purpose is to bring together people from business, industry, government and academia who are interested in the problems and applications of microcomputer systems.

For further details, write Euromicro, T.H. Twente, PO Box 217, 7500 AE Enschede, The Netherlands.

Computer Expo—Indiana

The second annual Indiana Computer Expo will be held at the Indianapolis Convention Center, Indianapolis, Indiana, on September 15th and 16th. The Exposition is particularly designed for business end users of micros and minis, and will deal with software and peripherals as well as basic computer systems.

For more information, call Ernie Kerns & Associates, 317-259-8111.

Twin Cities Show

The second annual Twin Cities Computer Show and Software Exposition will take place September 15–18 at the Minneapolis Auditorium in Minneapolis, MN. Show hours are 10:30 a.m. to 5:30 p.m.

The Show will feature microcomputers for business and personal use and a wide variety of relevant software and peripherals. For more information, contact Northeast Expositions, 822 Boylston St., Chestnut Hill, MA 02167; 800-841-7000 or, from Massachusetts, 617-739-2000.

Compufair in Seattle

Over 20,000 people are expected to attend Compufair Seattle, to be held September 16–18 at the Seattle Center Exhibition Hall. Compufair will be the most comprehensive personal computer show and seminar series the Pacific Northwest has ever seen.

Participation at the presentations and seminars is included in the $5 per day admissions charge. For more details, contact Tom Ikeda, Compufair, Inc., 909 N.E. 43rd St., Suite 302, PO Box 45218, Seattle, WA 98105; 206-633-3247.

Deep in the Heart of Texas

The first Heart of Texas Computer Show is scheduled for September 16–18 at the Convention Center in San Antonio. The emphasis of the Show will be on microcomputer-based small business systems.

For further information, contact Robin G. Mann at 512-226-4636, or write Heart of Texas, PO Box 12094, San Antonio, TX 78212.

REPCON '83—New York

REPCON '83, the Fall Electronics Fair, will be held September 21–23 at the Terrace on the Park, Flushing Meadow, Queens, NY. Open to the trade only, the exhibition will include personal computers, components and materials, as well as electronic games and home entertainment products.

For more information, call A.D. Adams Advertising, 212-685-9060.

SICOB—Paris in the Fall

SICOB, the leading French computer exhibition, is scheduled for Sept. 21–30 in the exhibition halls at CNIT, la Defense, Paris. Just preceding this event (Sept. 19–23), the 9th World Computer Congress, IFIP Congress '83, will be held at the Palais de Congres. The Congress is the annual conference of the International Federation for Information Processing (IFIP), with membership in 42 countries.

For full information on these events, contact Philip H. Dorn, Dorn Computer Consultants, Inc., 25 East 86th St., New York, NY 10028; 212-427-7460.

Rocky Mountain Show—Denver

The second annual Rocky Mountain Computer Show and Software Exposition will be held September 22–24 at the Merchandise Mart in Denver. Show hours are 10:30 a.m. to 5:30 p.m.

The Show will feature microcomputers for personal and business use as well as a wide variety of software and peripherals. For more information, contact Northeast Expositions, 822 Boylston St., Chestnut Hill, MA 02167; 800-841-7000 or, from Massachusetts, 617-739-2000.

Maecon/83 in Kansas City

The Maecon/83 High-Technology Electronics Exhibition and Convention is scheduled for September 26–28 in Bartle Hall, Kansas City, MO.

For more details, call Jerry Fossler, 213-772-2965.

ICC—Minneapolis

The second Invitational Computer Conference of the fall will take place on September 29 at Radisson South Hotel, Minneapolis, MN. (See ICC item above for more details.)

CP/M '83/East—Boston

CP/M '83/East, the International Conference and Exposition of CP/M microcomputer software, will be held September 29–October 1 at Hynes Auditorium in Boston, MA.

For further information, call 800-343-2222 or 617-739-2000.

PC '83—Boston

PC '83, an international conference and exposition featuring IBM Personal Computers and PC-compatibles, will be held October 4–6 at the Bayside Exposition Center in Boston.

Seminar programs and general sessions will deal with applications and technical information and will show users how to get the most from their PCs. For further information, write or call Northeast Expositions, 822 Boylston St., Chestnut Hill, MA 02167; 800-841-7000 or, in Massachusetts, 617-739-2000.

ONLINE '83—Chicago

ONLINE '83, the fifth annual conference and exposition for online database users, will take place October 10–12 at the Palmer House in Chicago. The focus of the conference will be on microcomputing software, particularly with reference to database and other information applications.

For program, application or other information, call Jean-Paul Emard, the Conference Chairman, at 203-227-8466.

EduTech/East—Philadelphia

EduTech/East '83, the national educational computer conference and exposition, will be held October 13–15 at the Philadelphia Civic Center. The conference will offer over 300 hours of sessions.

Presentations will include computer use in instruction, administration, research and many other areas. For further information, contact Carol Houts, Judco Computer Expos, Inc., 2629 North Scottsdale Road, Suite 201, Scottsdale, AZ 85257; 800-528-2355 or, within Arizona, 602-990-1715.

Education Conference—Silicon Valley

The IEEE Computer Society is sponsoring EdCompCom '83, a conference on educational uses of computer technology, to be held October 18–20 in Silicon Valley, with Conference headquarters in the Red Lion Inn, San Jose, CA.

The Conference will focus on potential and actual uses of the latest developments in computer-related hardware and software, including such innovations as touch screens and robotics. For further information, contact M. Dundee Maples, Conference Co-Chairman, Educational Computer, PO Box 535, Cupertino, CA 95015; 408-252-3224.

Software Show—San Francisco

The National Software Show will take place October 19–21 at the Trade Show Center in San Francisco. The Show is primarily for manufacturers to present their software packages to sales organization representatives.

Seminars and conference sessions will complement the many exhibits. For more information, call David Russell, President, Raging Bear Productions, at 800-732-2300 or, from within California, 415-924-1194.

Chicago Show

The Chicagoland Personal Computer Show will take place October 21–23 at O'Hare Expo Center. Its main aim is to inform the new personal computer buyer and to show him what is available. For additional information, write Chicagoland Personal Computer Show, Suite 400, 222 West Adams St., Chicago, IL 60606, or call Richard Lewis at 312-263-3131.

Applefest—San Francisco

Applefest/San Francisco will be held October 28–30 at the Moscone Center in San Francisco. It is the largest Apple-specific show in the country. For more details, call Northeast Expositions, 800-841-7000 or, from within Massachusetts, 617-739-2000.

Each month Microcomputing *will publish translations of selected programs published in the magazine. We encourage our readers to submit a hard copy of their conversions along with a cassette or disk of the program. Include a self-addressed, stamped envelope for the return of magnetic media if not selected for publication. Authors whose translations are chosen will receive payment for their efforts.*

Program conversion of the Cribbage program (April 1983) for the Heath H89/H19 systems. By J.C. Harper, Ascension Island, Patrick AFB, FL 32925.

```
10 '                        ------------------------------------
                            * * * * * * * * * * * * * * * * * *
                                        Cribbage
                                          by
                                      Chris Lindell
20 '                        from:    Microcomputing, April 1983
                            converted to:    Mbasic 5.2
                            by:   J.C. Harper, Ascenaion Ialsnd
                            for:    Heath H89/H19
30 '                        * * * * * * * * * * * * * * * * * *
                            ------------------------------------
40 '

44 WIDTH 255
45 DEFINT A-Z:OPTION BASE 1
46 I=0:J=0:C9=0:P9=0:Z=0:Z9=0:K=0
50 E$=CHR$(27):GRON$=E$+"F":GROF$=E$+"G":REV$=E$+"p":NORV$=E$+"q"
60 CURON$=E$+"y5":CUROF$=E$+"x5":ERS$=E$+"K":PRINT E$+"x4"
70 PRINT E$+"x1";E$+"x4";CUROF$:PAUSE=1000
80 DEF FN LOK$(ROW,COLUMN)=E$+"Y"+CHR$(31+ROW)+CHR$(31+COLUMN)
90 CL$=E$+"E":BEEP$=CHR$(7)
100 PRINT CL$;FN LOK$(12,25);"  CRIBBAGE  ":
    MSG$="PLEASE STAND-BY initializing variablea":GOSUB 7010
110 RANDOMIZE PEEK(11)
115 DIM W(6,4),M(6,4),J(52),V(15,7),I(52)
120 DIM D(52,4),C$(52),Y(6,4),C(4,4),
      D$(6),Q(11,6),R(4,5),S(4)
130 '
      ---------------INITIALIZE VARIABLES-----------------

140 FOR N=1 TO 15:FOR M=1 TO 7:READ V(N,M):NEXT:NEXT:GOSUB 7010
150 FOR N=1 TO 11:FOR M=1 TO 6:READ Q(N,M):NEXT:NEXT:GOSUB 7010
160 FOR N=1 TO 4:FOR M=1 TO 5:READ R(N,M):NEXT:NEXT:GOSUB 7010
170 FOR N=1 TO 4:READ S(N):NEXT:GOSUB 7010
180 FOR N=1 TO 6:READ D$(N):NEXT:GOSUB 7010
190 FOR I=1 TO 13
200     READ C$:IF I<>10 THEN C$=" "+C$
220     C$(I)=C$+"S "
240     C$(I+13)=C$+"C "
260     C$(I+26)=C$+"D "
280     C$(I+39)=C$+"H "
290 NEXT
300 S1=0:S2=0
310 '
      ------ SHUFFLE THE DECK AND CUT FOR DEAL, LOW CARD DEALS ------

320 GOSUB 5660
330 GOSUB 5820
340 '
                ------ SHUFFLE AND DEAL ------

350 GOSUB 5660
360 GOSUB 6100
370 '
      ------FIND THE BEST FOUR CARD, DISCARD THE OTHER TWO ------

380 GOSUB 3400
390 '
                        ------ DISCARDS ------

400 I1=V(B9,5)
410 I2=V(B9,6)
420 MSG$="YOUR DISCARDS? (INPUT 2 CARDS)    ":GOSUB 7010
430 PRINT CURON$;:INPUT;I3,I4:PRINT CUROF$
440 IF I3<1 THEN 460
450 IF I3<7 THEN 480
460 MSG$="now reallyBEEP$:GOSUB 7010
470 GOTO 420
480 IF INT(I3)<>I3 THEN 460
490 IF I4=I3 THEN 460
500 IF I4<1 THEN 460
510 IF I4>6 THEN 460
520 IF I4<>INT(I4) THEN 460
530 PST=((I3-1)*10)+13:LIN=4:PRINT FN LOK$(3,PST-2);"  ";:GOSUB 6480
540 PST=((I4-1)*10)+13:LIN=4:PRINT FN LOK$(3,PST-2);"  ";:GOSUB 6480
550 '
                        ------ CRIB ------

560 FOR J=1 TO 4
570     C(1,J)=M(I1,J)
580     C(2,J)=M(I2,J)
590     C(3,J)=Y(I3,J)
600     C(4,J)=Y(I4,J)
610 NEXT
620 '
                ------ GENERATE THE UPCARD ------

630 GOSUB 4200
640 '
                ------ PLAY THE HAND ------

650 GOSUB 1490
660 '
                ------ COUNT THE POINTS ------

670 IF M=0 THEN 710
680 MSG$="YOU SCORE FIRST ":GOSUB 7010
690 X1=1
700 GOTO 930
710 MSG$="I score first":GOSUB 7010
720 X1=2
```

More

Listing continued.

```
730 GOTO 1200
740 PRINT FN LOK$(13,28);" - - the crib contains - -  '
750 FOR I=1 TO 4
760     PST=((I-1)*10)+13:LIN=16:CARD$=C$(C(I,1)):RV=C(I,1):GOSUB 6320
770 NEXT
780 FOR I=1 TO 4
790     FOR J=1 TO 4
800             W(I,J)=C(I,J)
810     NEXT
820 NEXT
830 C=1
840 W(5,4)=T9
850 GOSUB 4420
860 ON X1 GOTO 870,910
870 R=P:GOSUB 9010
880 MSG$="The crib has "+STR$(P)+"pointa":GOSUB 7010
900 GOTO 1370
910 X1=3                                '
920 GOTO 1050
930 K=1
940 FOR I=1 TO 6
950     IF I=I3 THEN 1010
960     IF I=I4 THEN 1010
970     FOR J=1 TO 4
980             W(K,J)=Y(I,J)
990     NEXT
1000    K=K+1
1010 NEXT
1020 W(5,4)=T9
1030 C=0
1040 GOSUB 4420
1050 MSG$="How many pointa do you have":GOSUB 7010
1060 PRINT CURON$;:INPUT P9:PRINT CUROF$
1070 D=P-P9
1080 IF D>=0 THEN 1110
1090 MSG$="not with that handry again. "+BEEP$:GOSUB 7010:GOSUB 8010
1100 GOTO 1050
1110 R=P9:GOSUB 9040
1140 IF D=0 THEN 1190
1150 R=D:GOSUB 9010
1170 MSG$="muggins for "+STR$(D)+" pointaGOSUB 7010
1190 ON X1 GOTO 1200,740,1370
1200 FOR K=1 TO 4
1210    L=V(B9,K)
1220    FOR J=1 TO 4
1230            W(K,J)=M(L,J)
1240    NEXT
1250 NEXT
1260 FOR K=1 TO 4
1270    L=W(K,1)
1280 NEXT
1290 W(5,4)=T9
1300 C=0
1310 GOSUB 4420
1320 R=P:GOSUB 9010
1340 MSG$="I have "+STR$(P)+"pointa":GOSUB 7010
1360 ON X1 GOTO 740,930
1370 GOSUB 6390
1380 GOTO 350
1390 '
                ------ END OF GAME ------

1400 PRINT CL$
1410 PRINT FN LOK$(12,30);"I win ";S1;" to ";S2
1420 END
1430 PRINT CL$
1440 PRINT FN LOK$(12,30);"You win ";S2;" to ";S1
1450 END
1460 '
                ------ PLAY THE HAND ------

1490 Y5=0:M5=0:C=0:S9=0:G=0
1500 IF M=0 THEN 1910
1510 IF Y5<>4 THEN 1540
1520 IF M5=4 THEN 2470
1530 GOTO 1910
1540 MSG$="Your play. What card number?":GOSUB 7010
1550 PRINT CURON$;:INPUT C$:PRINT CUROF$:IF C$=""THEN C$="GO"
1560 IF C$="go" OR C$="GO" THEN 1910
1570 FOR C6=1 TO 6
1580    IF C$=D$(C6) THEN 1620
1590 NEXT
1600 MSG$="invalid play"+BEEP$:GOSUB 7010
1610 GOTO 1540
1620 IF C6=I3 THEN 1850
1630 IF C6=I4 THEN 1850
1640 IF Y5=0 THEN 1680
1650 FOR J=1 TO Y5
1660    IF I(10+J)=C6 THEN 1870
1670 NEXT
1680 IF S9+Y(C6,2)>31 THEN 1890
1690 S9=S9+Y(C6,2)
1700 Y5=Y5+1
1710 I(10+Y5)=C6
1720 C=C+1
1730 J(C)=Y(C6,4)
1740 GOSUB 2960
1750 PST=((C6-1)*10)+13:LIN=4:PRINT FN LOK$(3,PST-2);"X ";
1760 GOSUB 6390
1780 F=1
1790 R=P:GOSUB 9040
1820 IF S9<>31 THEN 1910
1830 F=0:C=0:S9=0:G=0
1840 GOTO 1910
1850 MSG$="You discarded that one, try again "+BEEP$:GOSUB 7010
1860 GOSUB 8010:GOTO 1540
1870 MSG$="already played - try again "+BEEP$:GOSUB 7010
1880 GOSUB 8010:GOTO 1540
1890 MSG$="that totals more than 31, try again "+BEEP$:GOSUB 7010
1900 GOSUB 8010:GOTO 1540
1910 IF M5<>4 THEN 2050
1920 IF Y5=4 THEN 2470
1930 IF C$<>"go" AND C$<>"GO" THEN 1510
1940 IF F=2 THEN 2000
1950 MSG$="You get 1 point for last card":GOSUB 7010
1960 R=1:GOSUB 9040
1980 F=0:C=0:S9=0
1990 GOTO 1510
2000 MSG$="I get 1 point for last card":GOSUB 7010
2010 R=1:GOSUB 9010
2030 F=0:C=0:S9=0
2040 GOTO 1510
2050 K9=0:P9=0
2060 C9=C
```

More

Listing continued.

```
2070 C=C+1
2080 H9=S9
2090 FOR I9=1 TO 6
2100    I(I9)=0
2110    IF I9=I1 THEN 2250
2120    IF I9=I2 THEN 2250
2130    IF M5=0 THEN 2170
2140    FOR J9=1 TO M5
2150            IF I9=I(20+J9) THEN BA=1:J9=M5
2160    NEXT:IF BA=1 THEN BA=0:GOTO 2250
2170    IF H9+M(I9,2)>31 THEN 2250
2180    K9=K9+1
2190    S9=H9+M(I9,2)
2200    J(C)=M(I9,4)
2210    GOSUB 2920
2220    IF P>P9 THEN P9=P
2230    I(I9)=P
2240    I(K9+30)=I9
2250 NEXT
2260 C=C9
2270 S9=H9
2280 IF K9<>0 THEN 2570
2290 IF C$<>"go" AND C$<>"GO" THEN 2360
2300 IF G=1 THEN 2370
2310 MSG$="I get 1 point for last card ":GOSUB 7010
2320 C=0:S9=0
2330 R=1:GOSUB 9010
2350 GOTO 1510
2360 IF Y5<>4 THEN 2430
2370 MSG$="I'll give you 1 point for last card ":GOSUB 7010
2380 R=1:GOSUB 9040
2400 C=0:S9=0:G=0
2410 C$=""
2420 GOTO 1910
2430 IF G=1 THEN 1510
2440 MSG$=SPACE$(10)+"GO":GOSUB 7010
2450 G=1
2460 GOSUB 8010:GOTO 1510
2470 IF F=0 THEN 2560
2480 IF F=1 THEN 2530
2490 MSG$="I get 1 point for last card ":GOSUB 7010
2500 R=1:GOSUB 9010
2520 GOTO 2560
2530 MSG$="you get 1 point for last card ":GOSUB 7010
2540 R=1:GOSUB 9040
2560 RETURN
2570 C=C+1
2580 M5=M5+1
2590 IF C<>1 THEN 2740
2600 FOR J9=1 TO 4
2610    I9=V(B9,J9)
2620    FOR VV%=1 TO M5-1
2630            IF I(VV%+20)=I9 THEN 2710
2635    NEXT
2640 '
             ------ DON'T PLAY A 5 FIRST ------

2650    IF M(I9,2)=5 THEN 2710
2660    I(M5+20)=I9
2670    J(C)=M(I9,4)
2680    P9=0
2690    S9=M(I9,2)
2700    GOTO 2810
2710 NEXT J9
2720 L=V(B9,1)
2730 GOTO 2660
2740 FOR J9=1 TO K9
2750    I9=I(J9+30)
2760    IF I(I9)=P9 THEN 2780
2770 NEXT
2780 I(M5+20)=I9
2790 J(C)=M(I9,4)
2800 S9=S9+M(I9,2)
2810 PRINT FN LOK$(7,30);"- - MY CARDS ARE - -";
2820 PST=((I9-1)*10)+13:LIN=10:PRINT FN LOK$(10,PST-2);:
     CARD$=C$(M(I9,1)):RV=M(I9,1):GOSUB 6320:GOSUB 6390
2830 F=2
2840 R=P9:GOSUB 9010
2870 IF S9<>31 THEN 2900
2880 F=0:C=0:S9=0
2890 GOTO 1510
2900 IF C$="go" OR C$="GO" THEN 1910
2910 GOTO 1510
2920 '
        ------ CHECK FOR 15, 31 RUNS ------

2960 P=0
2970 IF C=1 THEN 3200
2980 IF S9<>15 THEN 3010
2990 P=P+2
3000 GOTO 3030
3010 IF S9<>31 THEN 3030
3020 P=P+2
3030 IF C-2>2 THEN MAX=C-2 ELSE MAX=2
3040 FOR I=C TO MAX STEP -1
3050    IF J(I)<>J(I-1) THEN 3140
3060    ON C-I+1 GOTO 3070,3090,3110
3070    P=P+2
3080    GOTO 3120
3090    P=P+4
3100    GOTO 3120
3110    P=P+6
3120 NEXT
3130 '
                        ------ RUNS ------

3140 IF C=2 THEN 3200
3150 R9=0
3160 FOR I=3 TO C
3170    GOSUB 3210
3180 NEXT
3190 P=P+R9
3200 RETURN
3210 FOR J=1 TO C
3220    J(J+10)=J(C-J+1)
3230 NEXT
3240 FOR K=1 TO I
3250    FOR L=K+1 TO I
3260            IF J(K+10)<J(L+10) THEN 3300
3270            X=J(K+10)
3280            J(K+10)=J(L+10)
3290            J(L+10)=X
3300    NEXT
3310 NEXT
3320 FOR K=1 TO I-1
3330    IF J(K+10)<>J(K+11)-1 THEN 3360
3340 NEXT
3350 R9=I
3360 RETURN
3370 '
             ------ FIND BEST FOUR CARD HAND ------

3400 P9=0
3410 FOR Z9=1 TO 15
3420    I1=V(Z9,1)
3430    I2=V(Z9,2)
```

More →

Listing continued.

```
3440    I3=V(Z9,3)
3450    I4=V(Z9,4)
3460    FOR J=1 TO 4
3470            W(1,J)=M(I1,J)
3480            W(2,J)=M(I2,J)
3490            W(3,J)=M(I3,J)
3500            W(4,J)=M(I4,J)
3510            W(5,J)=25
3520    NEXT:GOSUB 7010
3530 '
             ------ EVALUATE THE HAND ------

3540    C=0
3550    GOSUB 4420
3560    V(Z9,7)=P
3570    IF P>P9 THEN P9=P
3580 NEXT:GOSUB 7010
3590 '
             ------ FIND ALL HANDS WITH MAX SCORE (P9) ------

3600 J=0
3610 FOR I=1 TO 15
3620    IF V(I,7)<>P9 THEN 3650
3630    J=J+1
3640    I(J)=I
3650 NEXT:GOSUB 7010
3660 IF J>1 THEN 3720
3670 '
             ------ THIS IS SINGLE BEST HAND ------

3680 B9=I(1)
3690 RETURN
3700 '
             ------ NO SINGLE BEST HAND.  SEARCH FOR KEY CARDS ------
                    ------ CHECK FOR FIVES ------

3720 C9=5
3730 Z=1
3740 GOTO 3960
3750 '
                    ------ CHECK FOR EIGHTS ------

3760 C9=8
3770 Z=2
3780 GOTO 3960
3790 '
                    ------ CHECK FOR SEVENS ------

3800 C9=7
3810 Z=3
3820 GOTO 3960
3830 '
                    ------ CHECK FOR JACKS ------

3840 C9=11
3850 Z=4
3860 GOTO 3960
3870 '
                    ------ CHECK FOR ACES ------

3880 C9=1
3890 Z=5
3900 GOTO 3960
3910 '
             ------ RANDOMLY CHOOSE A BEST HAND ------

3920 B9=INT(J*RND)+1
3930 B9=I(B9)
3940 RETURN
3950 '
             ------ BEST HAND CONTAINS MOST OF CARD C9 ------

3960 P9=0
3970 FOR I=1 TO 15
3980    J(I)=0
3990 NEXT
4000 FOR I=1 TO J
4010    FOR K=1 TO 4
4020            L=V(I(I),K)
4030            IF M(L,4)<>C9 THEN 4050
4040            J(I)=J(I)+1
4050    NEXT
4060    IF J(I)>P9 THEN P9=J(I)
4070 NEXT:GOSUB 7010
4080 K=0
4090 FOR I=1 TO J
4100    IF J(I)<>P9 THEN 4130
4110    K=K+1
4120    B9=I(I)
4130 NEXT
4140 IF K<>1 THEN 4160
4150 RETURN
4160 ON Z GOTO 3760,3800,3840,3880,3920
4170 '
                    ------ GENERATE THE UP CARD ------

4200 U=INT(RND*38)+14
4210 PRINT
4220 LIN=21:PST=63:CARD$=C$(D(U,1)):RV=D(U,1):
     PRINT FN LOK$(LIN,47);"THE UPCARD IS....":GOSUB 6320
4230 PRINT
4240 FOR I=1 TO 4
4250    W(5,I)=D(U,I)
4260 NEXT
4270 T9=W(5,4)
4280 IF W(5,4)<>11 THEN 4370
4290 IF M=0 THEN 4340
4300 MSG$="two points to me":GOSUB 7010
4310 R=2:GOSUB 9010
4330 RETURN
4340 MSG$="two points to you":GOSUB 7010
4350 R=2:GOSUB 9040
4370 RETURN
4390 '
             ------ SCORE THE FIVE CARD HAND ------

4410 '
             ------ check for nobs ------

4420 P=0
4430 IF C=1 THEN 4510
4440 FOR I=1 TO 4
4450    IF W(I,4)<>11 THEN 4490
4460    IF W(I,3)<>W(5,3) THEN 4490
4470    P=P+1
4480    GOTO 4510
4490 NEXT
4500 '
             ------ CHECK FOR 4 OR 5 CARD FLUSH ------

4510 FOR I=1 TO 3
4520    IF W(I,3)<>W(I+1,3) THEN 4630
4530 NEXT
4540 '
             ------ CRIB SCORES ONLY 5 CARD FLUSH ------

4550 IF C<>0 THEN 4600
```

More →

Listing continued.

```
4560 P=P+4
4570 IF W(4,3)<>W(5,3) THEN 4630
4580 P=P+1
4590 GOTO 4630
4600 IF W(4,3)<>W(5,3) THEN 4630
4610 P=P+5
4620 '
                ------ CHECK FOR 2 CARD 15s ------

4630 FOR I=1 TO 4
4640     FOR J=I+1 TO 5
4650             IF W(I,2)+W(J,2)<>15 THEN 4670
4660             P=P+2
4670     NEXT
4680 NEXT
4690 '
                ------ CHECK FOR 3 CARD 15s ------

4700 FOR I=1 TO 3
4710     FOR J=I+1 TO 4
4720             FOR K=J+1 TO 5
4730                     IF W(I,2)+W(J,2)+W(K,2)<>15 THEN 4750
4740                     P=P+2
4750             NEXT
4760     NEXT
4770 NEXT
4780 '
                ------ CHECK FOR 4 CARD 15s ------

4790 FOR I=1 TO 2
4800     FOR J=I+1 TO 3
4810             FOR K=J+1 TO 4
4820                     FOR L=K+1 TO 5
4830                             IF (W(I,2)+W(J,2)+W(K,2)+W(L,2))<>15 THEN 4850
4840                             P=P+2
4850                     NEXT
4860             NEXT
4870     NEXT
4880 NEXT
4890 '
                ------ CHECK FOR 5 CARD 15 ------

4900 S=0
4910 FOR I=1 TO 5
4920     S=S+W(I,2)
4930 NEXT
4940 IF S<>15 THEN 4960
4950 P=P+2
4960 '
                ------ CHECK FOR 2,3,4 OF A KIND ------

4970 FOR I=1 TO 13
4980     J(I)=0
4990 NEXT
5000 FOR I=1 TO 5
5010     J=W(I,4)
5020     J(J)=J(J)+1
5030 NEXT
5040 FOR I=1 TO 13
5050     ON J(I)+1 GOTO 5090,5090,5080,5070,5060
5060     P=P+6
5070     P=P+4
5080     P=P+2
5090 NEXT
5100 '
                ------SORT HAND ASCENDING SEQUENCE ------

5110 FOR I=1 TO 5
5120     FOR J=I TO 5
5130             IF W(I,4)<=W(J,4) THEN 5150
5140             SWAP W(I,4),W(J,4)
5150     NEXT
5160 NEXT
5170 '
                ------ CHECK FOR 5 CARD RUN ------

5180 D=W(1,4)-Q(1,1)
5190 FOR I=1 TO 11
5200     FOR J=1 TO 5
5210             Q(I,J)=Q(I,J)+D
5220     NEXT
5230 NEXT
5240 FOR I=1 TO 11
5250     FOR J=1 TO 5
5260             IF W(J,4)<>Q(I,J) THEN BA=1:J=5
5270     NEXT:IF BA=1 THEN BA=0:GOTO 5310
5280 '
                ------ 5 CARD RUN ------

5290     P=P+Q(I,6)
5300     RETURN
5310 NEXT
5320 '
                ------ CHECK FOR 4 CARD RUN ------

5330 FOR L=1 TO 2
5340     D=W(L,4)-R(1,1)
5350     FOR I=1 TO 4
5360             FOR J=1 TO 4
5370                     R(I,J)=R(I,J)+D
5380             NEXT
5390     NEXT
5400     FOR I=1 TO 4
5410             FOR K=1 TO 4
5420                     IF W(K+L-1,4)<>R(I,K) THEN BA=1:K=4
5430             NEXT:IF BA=1 THEN BA=0:GOTO 5470
5440 '
                ------ 4 CARD RUN ------

5450             P=P+R(I,5)
5460             RETURN
5470     NEXT
5480 NEXT
5490 '
                ------CHECK FOR 3 CARD RUN ------

5500 FOR L=1 TO 3
5510     D=W(L,4)-S(1)
5520     FOR I=1 TO 3
5530             S(I)=S(I)+D
5540     NEXT
5550     FOR I=1 TO 3
5560             IF W(L+I-1,4)<>S(I) THEN BA=1:I=3
5570     NEXT:IF BA=1 THEN BA=0:GOTO 5610
5580 '
                ------ 3 CARD RUN ------

5590     P=P+S(4)
5600     RETURN
5610 NEXT
5620 RETURN
5640 '
                ------ SHUFFLE ------

5660 FOR I=1 TO 52
5670     I(I)=0
```

More

Listing continued.

```
5680 NEXT
5690 FOR I=1 TO 52
5700     J=INT(RND*52)+1
5710     IF I(J)<>0 THEN 5700
5720     D(I,1)=J
5730     D(I,3)=INT((J-1)/13)+1
5740     D(I,4)=J-13*INT((J-1)/13)
5750     IF D(I,4)<10 THEN D(I,2)=D(I,4) ELSE D(I,2)=10
5760     I(J)=1
5770 NEXT
5780 RETURN
5800 '
                ------ CUT FOR DEAL ------

5820 MSG$="  cut for deal - (1-52) ":GOSUB 7010
5830 PRINT CURON$;:INPUT I:PRINT CUROF$
5840 IF I<1 THEN 5860
5850 IF I<53 THEN 5880
5860 MSG$="be serious nowBEEP$:GOSUB 7010
5870 GOTO 5820
5880 IF I<>INT(I) THEN 5860
5890 I1=D(I,1)
5900 PRINT FN LOK$(1,1);CL$;FN LOK$(10,15);"your card is...":
     PST=30:LIN=10:CARD$=C$(I1):RV=I1:GOSUB 6320
5910 J=INT(RND(I)*52)+1
5920 IF J=I THEN 5910
5930 J1=D(J,1)
5940 PRINT FN LOK$(16,15);"my card is.....";:
     CARD$=C$(J1):RV=J1:LIN=16:PST=30:GOSUB 6320
5950 IF D(I,4)<D(J,4) THEN M=1:MSG$="YOUR ":LIN=10:GOTO 6000
5960 IF D(J,4)<D(I,4) THEN M=0:MSG$="MY ":LIN=16:GOTO 6000
5970 PRINT BEEP$;FN LOK$(4,12);"please cut again ";
5980 GOTO 5830
6000 PRINT FN LOK$(LIN,40);GRON$;"-h";GROF$;REV$;MSG$;"CRIB";NORV$
6020 RETURN
6090 '
                ------ deal ------

6100 PRINT FN LOK$(1,1);CL$:R=0:S9=0:
     MSG$="  please wait, I'm looking at my cards ":GOSUB 7010:GOSUB 6390
6110 PRINT FN LOK$(20,12);:
     IF M=0 THEN PRINT "MY CRIB" ELSE PRINT "YOUR CRIB"
6120 M=1-M
6130 Y=1-M
6150 PRINT FN LOK$(1,29);" - - YOUR CARDS ARE - - "
6160 PRINT
6170 FOR I=1 TO 6
6180     K=2*I-Y
6190     L=2*I-M
6200     FOR J=1 TO 4
6210 '
                ------ COMPUTER'S HAND ------

6220             M(I,J)=D(K,J)
6230 '
                ------ PLAYER'S HAND ------

6240             Y(I,J)=D(L,J)
6250     NEXT


6260     PST=((I-1)*10)+13:LIN=4:PRINT FN LOK$(3,PST-2);:
         CARD$=C$(Y(I,1)):RV=Y(I,1):PRINT USING "#_.";I:GOSUB 6320
6270 NEXT
6280 RETURN
6290 '
                ------ DRAW A CARD ------

6320 IF RV>26 THEN PRINT REV$
6325 PRINT FN LOK$(LIN,PST);GRON$;"°";CARD$;"°";
     LIN=LIN-1:PRINT FN LOK$(LIN,PST);"°";"    ";"°"
6330 LIN=LIN+2:PRINT FN LOK$(LIN,PST);"°";"    ";"°";
     LIN=LIN+1:PRINT FN LOK$(LIN,PST);"e";STRING$(4,"a");"d"
6340 LIN=LIN-4:PRINT FN LOK$(LIN,PST);"f";STRING$(4,"a");"c";GROF$;NORV$
6350 RETURN
6360 '
                ------ GAME STATS ------

6390 PRINT FN LOK$(19,1);GRON$;STRING$(39,"a");"c"
6400 FOR VV=20 TO 24:PRINT FN LOK$(VV,40);"°";:NEXT
6410 PRINT FN LOK$(21,1);:
     PRINT USING "YOUR SCORE ....._ ###_  MY SCORE ...._ ###";S2,S1
6420 PRINT FN LOK$(22,1);:
     PRINT USING "SUM OF CARDS ..._ ##_  POINTS ......._ ##";S9,R
6430 PRINT FN LOK$(24,1);STRING$(39,"a");"d";GROF$;
6440 RETURN
6450 '
                ------ ERASE A CARD ------

6480 PRINT FN LOK$(LIN,PST);"      ":LIN=LIN-1:
     PRINT FN LOK$(LIN,PST);"      "
6490 LIN=LIN+2:PRINT FN LOK$(LIN,PST);"      ":
     LIN=LIN+1:PRINT FN LOK$(LIN,PST);"      "
6500 LIN=LIN-4:PRINT FN LOK$(LIN,PST);"      "
6510 RETURN
6520 '
                ------ DATA - CARD VALUES ------

6550 DATA 1,2,3,4,5,6,0,1,2,3,5,4,6,0,1,2,3,6,4,5,0
6560 DATA 1,2,4,5,3,6,0,1,2,4,6,3,5,0,1,2,5,6,3,4,0
6570 DATA 1,3,4,5,2,6,0,1,3,4,6,2,5,0,1,3,5,6,2,4,0
6580 DATA 1,4,5,6,2,3,0,2,3,4,5,1,6,0,2,3,4,6,1,5,0
6590 DATA 2,3,5,6,1,4,0,2,4,5,6,1,3,0,3,4,5,6,1,2,0
6600 DATA 1,1,1,2,3,09,1,1,2,2,3,12,1,1,2,3,3,12
6610 DATA 1,1,2,3,4,08,1,2,2,2,3,09,1,2,2,3,3,12
6620 DATA 1,2,2,3,4,08,1,2,3,3,3,09,1,2,3,3,4,08
6630 DATA 1,2,3,4,4,08,1,2,3,4,5,05
6640 DATA 1,1,2,3,6,1,2,2,3,6,1,2,3,3,6,1,2,3,4,4
6650 DATA 1,2,3,3
6660 DATA 1,2,3,4,5,6,A,2,3,4,5,6,7,8,9,10,J,Q,K
7000 '
                ------ WRITE MESSAGES ON LINE 25 ------

7010 PRINT FN LOK$(25,1):IF REV=1 THEN REV=0:
     PRINT REV$ ELSE PRINT NORV$:REV=1
7020 PRINT ERS$;MSG$;NORV$;
7030 RETURN
8000 '
                ------ WASTE OF TIME ------

8010 FOR Z3=1 TO PAUSE:NEXT:RETURN
9000 '
                ------ COMPUTER SCORE ------

9010 S1=S1+R:GOSUB 6390:GOSUB 8010
9020 IF S1>=121 THEN 1400
9030 RETURN
9035 '
                ------ PLAYER SCORE ------

9040 S2=S2+R:GOSUB 6390:GOSUB 8010
9050 IF S2>=121 THEN 1430
9060 RETURN
```

Timex-Sinclair 1000 program conversion of Healthful Hints program (January 1983) by Madeleine Moore, 6105 Tilden Lane, Rockville, MD 20852.

```
  10 REM THIS PROGRAM IS A GUIDE
  TO HEART DISEASE RISK.
  20 REM IT IS ONLY A GUIDE.
  CONSULT YOUR PHYSICIAN FOR
 MORE EXACT INFORMATION.
  30 REM ORIGINALLY WRITTEN IN
  MICROSOFT BASIC BY D.C. SMOEMA
 KER
  40 REM CONVERTED TO T.S 1000
 16K BY MADELEINE MOORE
  65 PRINT "GUIDE TO HEART DISEA
 SE RISK."
  67 PRINT
  70 PRINT "THIS PROGRAM WILL HE
 LP YOU"
  75 PRINT "ASSESS YOUR PRESENT
 RISK OF"
  80 PRINT "HEART DISEASE. IT IS
  A GUIDE"
  85 PRINT "ONLY, FOR MORE EXACT
  INFORMATION"
  90 PRINT "YOU SHOULD CONSULT Y
 OUR"
  91 PRINT "PHYSICIAN."
  93 PRINT
 100 PRINT "TO USE THIS PROGRAM"
 105 PRINT "JUST ANSWER THE QUES
 TIONS."
 110 PRINT
 120 PRINT "FIRST, YOUR AGE. CHO
 OSE FROM THE"
 125 PRINT "FOLLOWING AGE GROUPS
 "
 130 PRINT "1-TEN TO TWENTY YEAR
 S OLD"
 140 PRINT "2-TWENTY-ONE TO THIR
 TY YEARS OLD"
 150 PRINT "3-THIRTY-ONE TO FORT
 Y YEARS OLD"
 160 PRINT "4-FORTY-ONE TO FIFTY
  YEARS OLD"
 170 PRINT "5-FIFTY-ONE TO SIXTY
  YEARS OLD"
 180 PRINT "6-SIXTY-ONE AND OVER
 "
 190 PRINT "WHICH CATEGORY(1-6)"
 195 INPUT A
 200 IF A<1 OR A>6 THEN GOTO 120
 205 IF A=5 THEN GOTO 220
 210 IF A=6 THEN LET A=A+2
 215 GOTO 225
 220 LET A=A+1
 225 PRINT A
 230 CLS
 240 PRINT "NEXT IS THE HEREDITY
  FACTOR."
 245 PRINT "SELECT FROM THE FOLL
 OWING"
 250 PRINT "1-NO KNOWN HISTORY O
 F HEART"
```

More

Listing continued.

```
 255 PRINT "   DISEASE IN THE FAM
 ILY"
 260 PRINT "2-ONE RELATIVE WITH
 HEART"
 265 PRINT "   DISEASE, OVER SIXT
 Y"
 270 PRINT "3-TWO RELATIVES WITH
  HEART"
 275 PRINT "  DISEASE, OVER SIXTY
 "
 280 PRINT "4-ONE RELATIVE WITH
 HEART"
 285 PRINT "   DISEASE, UNDER SIX
 TY"
 290 PRINT "5-TWO RELATIVES WITH
 HEART"
 295 PRINT "   DISEASE, UNDER SIX
 TY"
 300 PRINT "6-THREE RELATIVES WI
 TH HEART"
 305 PRINT "   DISEASE, UNDER SIx
 TY."
 310 PRINT "WHAT CATEGORY(1-6)"
 315 INPUT H
 320 IF H<1 OR H>6 THEN GOTO 240
 330 IF H=5 OR H=6 THEN LET H=H+
 1
 340 PRINT H
 350 CLS
 360 PRINT "NOW FOR YOUR WEIGHT.
 "
 365 PRINT "CHOOSE FROM THE FOLL
 OWING."
 370 PRINT "1-MORE THAN 5 POUNDS
  UNDER THE"
 380 PRINT "   STANDARD WEIGHT FO
 R YOUR"
 385 PRINT "   HEIGHT"
 390 PRINT "2-BETWEEN -5 AND +5
 POUNDS OF"
 395 PRINT "   THE STANDARD"
 400 PRINT "3-6 TO 20 POUNDS OVE
 RWEIGHT"
 410 PRINT "4-21 TO 35 POUNDS OV
 ERWEIGHT"
 420 PRINT "5-36 TO 50 POUNDS OV
 ERWEIGHT"
 430 PRINT "6-MORE THAN 50 POUND
 S OVERWEIGHT"
 440 PRINT "WHICH CATEGORY(1-6)"
 445 INPUT U
 450 IF U<1 OR U>6 THEN GOTO 360
 452 IF U=1 OR U=2 OR U=3 THEN G
 OTO 465
 455 IF U=4 OR U=5 OR U=6 THEN L
 ET U=U+2
 460 GOTO 470
 465 LET U=U-1
```

More

Listing continued

```
 470 PRINT U
 480 CLS
 500 PRINT "SMOKING HABITS ARE N
 EXT. SELECT"
 505 PRINT "FROM THE FOLLOWING G
 ROUPS."
 510 PRINT "1-NON-SMOKER"
 520 PRINT "2-CIGAR AND/OR PIPE"
 530 PRINT "3-10 OR FEWER CIGARE
 TTES PER DAY"
 540 PRINT "4-20 CIGARETTES A DA
 Y"
 550 PRINT "5-30 CIGARETTES A DA
 Y"
 560 PRINT "6-40 OR MORE CIGARET
 TES A DAY"
 570 PRINT "WHICH CATEGORY(1-6)"
 575 INPUT T
 580 IF T<1 OR T>6 THEN GOTO 500
 585 IF T=1 OR T=2 THEN GOTO 612
 590 IF T=3 THEN GOTO 616
 600 IF T=4 THEN GOTO 620
 610 IF T=5 OR T=6 THEN LET T=T+
 5
 611 GOTO 625
 612 LET T=T-1
 614 GOTO 625
 616 LET T=T+1
 618 GOTO 625
 620 LET T=T+2
 625 PRINT T
 630 CLS
 640 PRINT "NOW FOR YOUR EXERCIS
 E PATTERNS."
 645 PRINT "CHOOSE FROM "
 650 PRINT "1-INTENSIVE OCCUPATI
 ON AND"
 655 PRINT "   RECREATIONAL EXERT
 ION"
 660 PRINT "2-MODERATE OCCUPATIO
 NAL AND"
 665 PRINT "   RECREATIONAL EXERC
 ISE"
 670 PRINT "3-SEDENTARY WORK AND
  INTENSE"
 675 PRINT "   RECREATIONAL EXERC
 ISE"
 680 PRINT "4-SEDENTARY OCCUPATI
 ONAL AND"
 690 PRINT "   MODERATE RECREATIO
 NAL EXERCISE"
 700 PRINT "5-SEDENTARY WORK AND
  LIGHT"
 705 PRINT "   RECREATIONAL EXERC
 ISE"
 710 PRINT "6-COMPLETE LACK OF A
 LL EXERCISE"
 720 PRINT "WHICH CATEGORY(1-6)"
 725 INPUT E
 730 IF E<1 OR E>6 THEN GOTO 640
 740 IF E=4 OR E=5 THEN GOTO 755
 745 IF E=6 THEN LET E=E+2
 750 GOTO 760
 755 LET E=E+1
 756 GOTO 760
 760 PRINT E
 770 CLS
 780 PRINT "YOUR DIET CHOLESTERO
 L IS NEXT."
 790 PRINT "CHOOSE FROM THE FOLL
 OWING."
 800 PRINT "1-CHOLESTEROL BELOW
 180 MG."
 810 PRINT "   DIET CONTAINS NO A
 NIMAL OR"
 815 PRINT "   SOLID FATS"
 820 PRINT "2-CHOLESTEROL 181-20
 5 MG."
 830 PRINT "   DIET CONTAINS 10 P
 ERCENT"
 831 PRINT "   ANIMAL OR SOLID FA
 TS"
 840 PRINT "3-CHOLESTEROL 206-23
 0 MG."
 850 PRINT "   DIET CONTAINS 20 P
 ERCENT"
 851 PRINT "   ANIMAL OR SOLID FA
 TS"
 860 PRINT "4-CHOLESTEROL 231-25
 0 MG."
 870 PRINT "   DIET CONTAINS 30 P
 ERCENT"
 871 PRINT "   ANIMAL OR SOLID FA
 TS"
 880 PRINT "5-CHOLESTEROL 256-28
 0 MG."
 890 PRINT "   DIET CONTAINS 40 P
 ERCENT"
 891 PRINT "   ANIMAL OR SOLID FA
 TS"
 900 PRINT "6-CHOLESTEROL 281-30
 0 MG."
```

Listing continued

```
 910 PRINT "   DIET CONTAINS 50 P
 ERCENT"
 911 PRINT "   ANIMAL OR SOLID FA
 TS"
 915 PRINT "WHICH CATEGORY(1-6)"
 920 INPUT C
 930 IF C<1 OR C>6 THEN GOTO 780
 940 IF C=6 THEN LET C=C+1
 945 PRINT C
 950 CLS
 960 PRINT "NOW FOR YOUR BLOOD P
 RESSURE."
 965 PRINT "SELECT FROM THE FOLL
 OWING."
 970 PRINT "1-UPPER READING OF 1
 00"
 980 PRINT "2-UPPER READING OF 1
 20"
 990 PRINT "3-UPPER READING OF 1
 40"
1000 PRINT "4-UPPER READING OF 1
 60"
1010 PRINT "5-UPPER READING OF 1
 80"
1020 PRINT "6-UPPER READING OF 2
 00 OR OVER"
1025 PRINT "WHICH CATEGORY(1-6)"
1030 INPUT P
1040 IF P<1 OR P>6 THEN GOTO 960
1045 IF P=5 THEN GOTO 1056
1050 IF P=6 THEN LET P=P+2
1055 GOTO 1060
1056 LET P=P+1
1057 GOTO 1060
1060 PRINT P
1070 CLS
1080 PRINT "FINALLY, YOUR SEX."
1085 PRINT "CHOOSE FROM THE FOLL
 OWING."
1090 PRINT "1-FEMALE UNDER AGE 4
 0"
1100 PRINT "2-FEMALE OF AGE 40 T
 O 50"
1110 PRINT "3-FEMALE OVER 50"
1120 PRINT "4-MALE"
1130 PRINT "5-STOCKY MALE"
1140 PRINT "6-BALD, STOCKY MALE"
1145 PRINT "WHICH CATEGORY(1-6)"
1150 INPUT S
1155 IF S<1 OR S>6 THEN GOTO 108
 0
1160 IF S=4 OR S=5 OR S=6 THEN L
 ET S=S+1
1165 PRINT S
1190 CLS
1200 REM TALLY THE FACTORS
1220 LET GT=A+M+U+T+E+C+P+S
1230 CLS
1240 PRINT "RESULTS OF THIS QUIZ
  SUGGEST"
1250 PRINT "THAT YOUR RISK OF SU
FFERING"
1260 PRINT "A HEART ATTACK IS"
1300 IF GT>40 THEN GOTO 1360
1310 IF GT>=31 THEN GOTO 1380
1320 IF GT>=24 THEN GOTO 1390
1330 IF GT>=17 THEN GOTO 1400
1340 IF GT>=11 THEN GOTO 1410
1350 GOTO 1420
1360 PRINT "AT A DANGEROUS AND U
RGENT LEVEL."
1370 GOTO 1430
1380 PRINT "AT A DANGEROUS LEVEL
"
1385 GOTO 1430
1390 PRINT "MODERATE"
1395 GOTO 1430
1400 PRINT "GENEROUSLY BELOW AVE
RAGE"
1405 GOTO 1430
1410 PRINT "BELOW AVERAGE"
1415 GOTO 1430
1420 PRINT "WELL BELOW AVERAGE"
1425 PRINT
1430 PRINT "REMEMBER, THIS IS ON
LY A GUIDE."
1440 PRINT "IT IS NOT A SUBSTITU
TE FOR"
1445 PRINT "COMPETENT MEDICAL AD
VICE."



2000 REM HEALTHFUL HINTS PROGRAM
 (JANUARY 1983 MICROCOMPUTING) T
RANSLATED FOR T.S 1000 16K BY
       MADELEINE MOORE
       6106 TILDEN LANE
       ROCKVILLE, MD. 20852
```


VIC-20 program conversion of Micro Money-Maker (September 1982) by Brian McCown, 1021 Trenton Drive, Pensacola, FL 32505.

```
 10 PRINT"□"
 30 REM
 40 REM THIS PROGRAM
 50 REM CALCULATES THE
 51 REM THE FUTURE
 52 REM VALUE OF CASH
 53 REM FLOWS
 54 REM
 60 REM WRITTEN BY
 61 REM JOE NAJJAR III
 62 REM
 63 REM MODIFIED FOR
 64 REM COMMODORE BY
 65 REM BRIAN D. MCCOWN
 90 REM
120 REM INITIALIZE
121 REM PROGRAM TO
122 REM ACCEPT 100
123 REM DIFFERENT CASH
124 REM FLOW AMOUNTS
130 REM
140 REM CF(X)=CASH
141 REM AMOUNT # X
150 REM
160 REM N(X)=NUMBER
161 REM CONSECUTIVE
162 REM REPEPITIONS
163 REM OF CASH FLOW
164 REM NUMBER X
170 REM
190 DIMCF(100),N(100)
```

More

Listing continued

```
200 OPEN4,4 :REM OPENING PRINT FILE
220 C=1:P=1
230 REM
231 REM INPUT CASH
232 REM FLOWS AND
233 REM CONSECTUIVE
234 REM PERIODS
235 REM
240 PRINT"PERIOD # = ";P
250 PRINT"CASH FLOW AMOUNT":INPUTA$
260 IFA$="END"ANDC<>1THEN470
265 CF(C)=VAL(A$):IFCF(C)=0ANDA$<>"0"THEN390
280 N(C)=1
290 PRINT"NO. OF CONSECUTIVE":PRINT"SIMILAR CASH FLOWS"
300 INPUTN(C):IFN(C)<>INT(N(C))ORN(C)<=0THEN390
360 IFN(C)>1THEN GOSUB 410
370 C=C+1:P=P+1
390 GOTO240
410 FOR K=3 TO N(C):P=P+1
450 PRINT"P";P;"CF";CF(C)
460 NEXTK:RETURN
470 C=C-1
480 REM
490 REM INPUT INTEREST
492 REM RATE
500 REM
530 PRINT"  WHAT IS THE ASSUMED    INTEREST RATE PER     PERIOD (IN %)"
531 INPUTII
540 IFII=0 THEN 530
550 II=II/100
570 REM
580 REM CALCULATE THE
581 REM FUTURE VALUE
590 REM
610 NN=0:T=0
620 FOR X=C TO 1 STEP -1
630 FOR Y=1 TO N(X)
640 NN=NN-CF(X)*(1+II)^T
650 T=T+1
660 NEXTY,X
670 FV=NN
690 REM
700 REM VIDEO DISPLAY
710 REM OF RESULT
720 REM
730 PRINT"THE FUTURE VALUE":PRINT"  IS";FV
750 REM
760 REM ASK IF HARD
770 REM COPY IS DESIRED
780 REM
800 PRINT:PRINT"DO YOU WANT A HARD":PRINT"COPY PRINT OUT (Y/N)"
810 INPUTA$:IF A$="Y" THEN GOSUB 1010
820 IF A$<>"N" THEN 800
830 A$=""
840 REM
```

More

Listing continued

```
850 REM NEW INTEREST
851 REM RATE?
870 REM
890 PRINT"  DO YOU WANT TO        RECALUTE AT A"
891 PRINT"  DIFFERENT INTEREST    RATE":INPUTA$
900 IFA$="Y"THEN530
910 IFA$<>"N"THEN890
940 REM
950 REM COMPLETE RERUN?
960 REM
970 A$=""
980 PRINT"  DO YOU WANT TO RUN    AGAIN FROM SCRATCH    (Y OR N)"
981 INPUTA$
990 IFA$="Y"THEN220
1000 IFA$="N"THENEND
1005 GOTO980
1010 A$="N"
1020 REM
1030 REM HARD COPY
1040 REM PRINT OUT
1050 REM ROUTINE
1055 REM
1060 FOR X=1 TO 5:PRINT#4   NEXTX
1080 PRINT#4,"  FUTURE VALUE SUMMARY":PRINT#4
1090 PRINT#4,"  ASSUMED INTEREST RATE PER PERIOD";II*100;"%":PRINT#4
1100 PRINT#4,"  CASH FLOW DETAIL":PRINT#4
1110 PRINT#4,"  PERIOD";SPC(7);"CASH FLOW";SPC(6);"NO. OF CONSECTUTIVE"
1120 PRINT#4,"  NUMBER";SPC(7);"AMOUNT";SPC(9);"SIMILAR CASH FLOWS"
1130 PRINT#4:BL$="          "
1140 P=1:FOR X=1 TO C
1145 P$=STR$(P):CF$=STR$(CF(X)):N$=STR$(N(X))
1150 PRINT#4,LEFT$(BL$,(7-LEN(P$)));P$;SPC(16-LEN(CF$));
1155 PRINT#4,CF$;SPC(16-LEN(N$));N$
1160 P=P+N(X):NEXT X
1170 PRINT#4:PRINT#4:PRINT#4
1180 PRINT#4,"  FUTURE VALUE = $";FV:RETURN
```

Article Ideas—Write On

Microcomputing relies on you, the reader, to provide applications, reviews, construction articles...to keep your fellow readers abreast of developments in the microcomputing field.

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Apple Programming Practice
Crack Coverage of Computer Architecture
A Potent Data Processing Reference
Conversion Handbook to the Rescue!

Basic Exercises For the Apple

J.P. Lamoitier
Sybex, 1982
2344 Sixth St.
Berkeley, CA 94710
Softcover, 232 pp., $12.95

J.P. Lamoitier's *Basic Exercises for the Apple* is exactly what its name implies—programming exercise. The book covers the use of flowcharts, geometry, data processing, mathematical computations, financial computations, games, operations research, statistics and some miscellaneous exercises—and all of these concepts are supported by program listings.

The chapter on flowcharting is exceptional. It offers insight on how to use flowcharts in planning alternate methods of problem-solving. It also offers a means of "desk-checking" the flowchart to verify its validity before you start programming.

Typically, the book introduces a mathematical concept, such as Armstrong numbers. ("Numbers that are equal to the sum of the cubes of their digits are known as Armstrong numbers.") Following the definition is a programming exercise. ("Write a program that outputs all Armstrong numbers between 1 and 2000.")

The next step in the author's format is an analysis of the programming required, followed by a flowchart, a listing of the program and a printout of the program run. In many cases, the presentation is concluded with a criticism of the program presented and ideas on how to improve it.

This works very well, provided the reader does his part. Since my mathematical abilities are limited, I felt my brain creak whenever I was forced to learn to use a "new" mathematical concept. (Now I understand what Armstrong numbers are, and how to write a program that will list them for me, but I haven't the faintest idea what to do with them.)

Somehow, though, going through the exercises taught me some new programming techniques, so it appears that even a mathematical klutz can get some good out of it.

The reader who has "... a minimum of scientific or technical background..." should have a field day with this book—especially if his work or hobby involves Egyptian fractions, Fibonacci maximum algorithms, prime numbers, Cartesian coordinates, Hero's formula, linear regression, polygonal fields, Simpson's rule, Weddle's method and analytic geometry. I, for one, found it rather intimidating.

One set of program exercises made this book worth its price for me—conversion of base 10 numbers to binary and hexadecimal. These programs will go into my library for future use when I graduate out of Basic to a lower-level language.

The title of *Basic Exercises for the Apple* is accurate in one sense but misleading in another. Although it's certainly a book of exercises in Basic, it is *not* a book *of* basic exercises.

David Goodfellow
Seattle, WA

Introduction to Computer Architecture and Organization

Harold Lorin
John Wiley & Sons, 1982
605 Third Ave.
New York, NY 10158
Clothbound, 300 pp., $30

Anyone who has a basic understanding of computer languages and operation and wants to explore the underlying concepts used in the design of today's central processing units will find *Introduction to Computer Architecture and Organization* appealing. It's a college-level textbook, but it's written so that people with technical interests also can learn the concepts explained.

This 311-page book is divided into two parts. The first deals with computer architecture, and the second concentrates on organization and implementation. A complete index of almost six pages concludes the book. This book is "all meat"—it uses diagrams and drawings sparingly.

Coverage of the main topic is excellent. This is the first book I've read in which the author actually admits that the term "computer architecture" has no precise meaning. Any author willing to admit that something computer-related has no precise definition obviously has something to offer.

It begins with simple explanations of register models and proceeds through instruction sets and assembly languages. Register organization, memory-addressing conventions, programming sequencing, interrupt mechanisms and control states... these concepts and many more are clearly and concisely described.

The book is fairly generalized, but uses specific examples from the IBM S/370, Series/1 and 8100, Sperry Rand Univac 1100, Cray Research CRAY-1, Digital Equipment Corp.'s VAX-11, Data General Nova and Intel 8080 and 8086 computers. These machines are not explained so much as they are used to provide examples of organization and architecture.

The style is crisp. New concepts are explained as they are encountered. The index is full and complete, making the book one of the best combined text and reference manuals around. It was written to be used by students, and as such it is well-done. But it also can be used by the serious or technically-minded person, without the benefit of a classroom. But be forewarned: this is a technical book, and people without an adequate background and substantial technical interests will find it too detailed. This is an enjoyable,

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The basic system has an 8088 processor, 32K ROM (including assembler, editor and debugger) and 16K RAM.

The unit also features a serial I/O printer port, cassette interface and a detached 95-key keyboard (including 16 function keys and a numeric keypad) which generates a full ASCII character set. It's available either in kit form or factory assembled.

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If you're interested in learning more about the architectural design of a computer, or are involved in computer education in high school or college, this book certainly belongs in your collection. And it's new—and not just another 1960 or 1970 text in reprint.

Jim Hansen
New Boston, NH

Data Processing: An Introduction with Basic

Donald Spencer
Charles E. Merrill Publishing Co., 1982
1300 Alum Creek Drive
Columbus, OH 43216
Clothbound, 500 pp., $18.95

One of the first things I look for in any textbook is a good index, but it seems that fewer and fewer publishers are taking the time to include a truly useful one. *Data Processing: An Introduction with Basic* is a welcome exception.

While the index is not exhaustive—it doesn't list every page on which a chosen subject is mentioned—it is complete enough to be useful. Indeed, by avoiding the one-word-mentions of most items, this index doesn't send you off chasing useless references. A fairly complete glossary expands many of the definitions used in the book.

These two features, coupled with a color-coded, detailed table of contents and the author's preface (which steps you through the book's organization), make *Data Processing* an easy text to get into. I also like the use of big, bold page numbers at the top of each page; you can flip through the book quickly to find an index reference. Most chapters start with a two-page color spread over a graphic paper grid and end with a colored box of "key terms."

The book is divided into four major parts, each with an appropriate introduction or summary. There are ample color photographs, drawings, cartoons, charts, colored headings and bold type. I particularly like the use of the three-inch edge margins on each page for summaries, headings and picture captions. The pages are eight inches wide, but straight text is confined to the five inches out from the spine. This leaves plenty of white space along the edges, making the book appear open and uncluttered—even though each page is packed with information.

As a teacher of programming and computer fundamentals, I can see a definite application of author Donald Spencer's text to many of my college classes. His book offers the student an excellent introduction to computing in general, the history of computers and the hardware/software requirements of modern computer systems.

The 130-page section dedicated to Basic programming introduces programming concepts and Basic commands. An interesting graphics technique demonstrates program form and the results of program execution: virtually every page in the programming section has a color drawing of a computer screen illustrating the program concepts discussed in the text. The author uses practical program examples such as compound interest, business sales computation and area of regular shapes.

Each major section is followed by a summary and review questions. The publisher offers separate student and instructor guides to supplement the text. Chapter objectives, sample test questions and more than 200 transparency masters are included in the instructor's manual. The student guide offers additional review questions, chapter highlights and more terms to define. A scripted slide presentation also is available separately.

Obviously, *Data Processing* is designed as a textbook in formal teaching situations, and that's the way it should be used. Even with the author's careful organization, there is so much information on each page that the beginner with no previous computer experience will need additional support to get the most from the material.

Data Processing: An Introduction with Basic is a comely, colorful, compact text. Nearly any data processing professional would enjoy having it for reference.

Apparently, this is what Spencer had in mind, because he points out that "An exhaustive treatment of subject matter has been avoided." I like this approach because it enhances the value of the text as a quick reference to most topics on computers and computing.

My experience with teaching adults over the past six years has shown, however, that inexperienced students usually cannot comprehend complicated computer subjects unless they get a careful interpretation from an instructor or a simplified text. Incredible as it may seem to anyone with computer experience, completely inexperienced students frequently cannot grasp concepts such as "A computer network is a cost-effective way to distribute high-speed computer services to a large number of users. In the future, global computer networks, using international information and databases, may very well make computer power available to everyone in the same way the electric and other utilities service our homes and offices."

I can anticipate such questions as "What services?" "Why connect computers together?" "What data?" "What is a database?" "Why would I want computer power in my home?"

My only major complaint with the text is its shallow treatment of microcomputers and the burgeoning network/database systems available for them. The original copyright date is 1978, with a revision in 1982. I haven't read the original, but I think I can see the results of this revision: pictures of newer computer systems and mentions of some of the latest technology. The text's orientation still is from the "big machine" perspective.

Spencer talks about the *future* uses of micros, but neglects current happenings. It's hard to keep up with the rapidly changing technology, but Spencer seems to be two or three years behind the times. His projection that, "By 1985, many working professionals. . . will be using computers," and that "many small businesses" and "many homes" will be equipped with microcomputers is a conservative estimate, at best.

Spencer doesn't see widespread use of the microcomputer until sometime in the next decade. He predicts a 16,000-character computer for less than $100 by 1985. The TS-1000 made this prediction a reality in 1983, and other relatively inexpensive but powerful microcomputers already have placed computers in the hands of "many" professionals and individuals. In 1982 alone, nearly three million microcomputers were sold for homes and businesses.

Overall, *Data Processing: An Introduction with Basic* is a comely, colorful, compact text. Nearly any data processing professional would enjoy having it for reference. Teachers in the field will find it particularly helpful, but the beginning student will need additional support.

Tom Badgett
Bluefield, WV

A Practical Guide to Word Processing and Office Management Systems

Mary Jane Forbes
Digital Equipment Corp., 1982
12 Crosby Drive
Bedford, MA 01730
Paperback, 200 pp., $22

This slim paperback book was published by DEC to help people understand

word processing and office systems terminology. It's crammed with information—some general, some vague—on text processing. A detailed list of references, organized by chapter, concludes the book.

Unfortunately, *A Practical Guide to Word Processing and Office Management Systems* is hard to read. At least four typestyles of assorted size are used. The author uses bold type randomly, but gets so carried away with the flexibility of the modern phototypesetter that the result is extremely hard-to-read text.

Since there isn't even an index to help you locate anything of interest, my suggestion is to politely accept a complimentary copy from your DEC salesman, but hang on to your money if he tries to sell it to you.

Jim Hansen
New Boston, NH

The Basic Conversions Handbook for Apple, TRS-80, and Pet Users

The Brain Bank
(David Brain, Philip Oviate, Paul Paquin and Chandler Stone)
Hayden, 1982
50 Essex St.
Rochelle Park, NJ 07662
Softcover, 80 pp., $8.95

Why does it happen that when you find a nice, useful Basic program it's written only for the TRS-80, and you have a Pet, or maybe an Apple II? You have to pass it up because you just can't transfer programs easily between machines.

Well, hold on, because there's a book on the market—*The Basic Conversions Handbook for Apple, TRS-80, and Pet Users*—that may come to your rescue.

The Basic Conversions Handbook covers the following conversions:

- Apple and Pet into TRS-80 programs;
- TRS-80 and Pet into Apple II programs;
- TRS-80 and Apple II programs into Pet programs.

Each of these sections includes a list that compares computer A and computer B commands and the forms in which the commands are used by each machine. Commands with a direct relationship between two computers are listed, while commands that have no conversion equivalent to the other computer are listed as NONE, with an explanation of the command.

For example, CLS is the TRS-80 statement that clears the display screen. If you are converting from TRS-80 to Apple II, looking up CLS will give you HOME. But if you try to convert a TRS-80 command that is not available on the Apple II, such as PRINT USING, a NONE will be given for the Apple II.

When converting from one computer to another, there will be commands that you cannot convert, as in the above example. When you encounter such a problem, as in graphics conversions, the authors suggest that you first determine what the graphics on one computer will be and then attempt to create your own graphics, referring to the screen charts at the back of the book.

Use your imagination, the authors state. What do they mean? If you could dream up graphics conversions of your own, then you wouldn't need the book. The point is that it's difficult to convert programs with extensive graphics, such as arcade games, and that your attempts to use this book for that purpose would be a wasted effort.

On a similar subject, the authors talk about converting machine language programs or routines. They suggest that you try to "create" your own functional equivalent routines in Basic. Again, I'll have to disagree with these suggestions, since the purpose of machine language routines usually involves speed considerations. Machine language programs are written because the function they perform requires speed.

If it were possible to convert machine language to Basic, that would defeat the purpose, and the program would probably run too slowly. At any rate, you couldn't replace machine language routines for Basic in arcade-type games. They just wouldn't work correctly.

This book could be used to convert programs that do not make extensive use of graphics. I would also stay away from trying to convert programs using PEEK and POKE statements, although they are covered in the book. These commands relate to the internal functions of the computer, and it's difficult to make function comparisons between machines.

The book is quite thorough, though, in its comparisons, and could be beneficial to those who need to convert Basic programs between machines. It also could be used as a guide for converting programs between other computers and those mentioned. For example, the section on TRS-80 to Pet conversions could be used as a guide to translate programs from the TRS-80 to the VIC-20, because the Pet and the VIC-20 have similar Basics.

Another section covers sample conversions; it would be helpful for comparing your first conversion attempts to those already listed.

In general, this book could be used as a guide to converting some types of Basic programs from one machine to another. And it may be quite helpful in converting business or educational-type Basic programs that use little or no graphics. But I wouldn't rely on it alone to help you convert Basic programs using graphics or machine language routines.

Howard Berenbon
W. Bloomfield, MI

NEW SOFTWARE

Edited by Dan Muse

It's Not Tax Time, But . . .

Micro-Tax (Microcomputer Taxsystems, Inc., 6203 Variel Ave., Suite A, Woodland Hills, CA 91367) is a complete tax preparation system.

Micro-Tax will allow you to compute and print over 30 schedules and forms for multiple clients; you can automatically compute underpayment penalties, self-employment taxes, minimum taxes, as well as income averaging.

Micro-Tax will let you produce returns that look exactly like those required by the government. Micro-Tax runs on systems with CP/M, PC DOS and MS DOS.

As part of its "post tax season sale," you can purchase Micro-Tax from Microcomputer Taxsystems for $58. Reader Service number 474.

Poly Want a Library?

The PolyLibrarian, an object module librarian for the IBM Personal Computer, is a productivity enhancement software package for programmers who use the MS DOS (PC DOS) operating system.

The PolyLibrarian is designed to organize related object code modules (.OBJ files) into a single library (.LIB file). The IBM PC Linker will then automatically select only the modules necessary to construct an executable program (.EXE file).

The PolyLibrarian works with any compiler or assembler that uses the IBM PC Linker. By providing mainframe librarian functions, the product decreases software development time. Programmers can reduce code size, simplify structured programming, construct their own libraries, or examine and reorganize existing libraries.

To run PolyLibrarian, you need an IBM PC with MS DOS Version 1.0, 1.1 or 2.0, and 64K of RAM. The software costs $99 and is available from Polytron Corp., PO Box 787, DS 2-210, Hillsboro, OR 97123. Reader Service number 469.

Back Up

The Bakup Package, from Computer Dynamics, Inc. (105 S. Main St., Greer, SC 29651), is a set of machine-language programs for Z-80-based computers using CP/M 2.2.

The programs are designed to be used for file archival operations with systems using hard disk and floppy disk storage.

The Bakup Package includes utilities for making back-up copies of hard disk files on floppy disks, automatically fragmenting files too large for one disk onto separate disks, and a utility for restoring files archived on floppy disks back to the hard disk. Bakup also provides a method to determine the archive status of files and displays an extended disk directory of the archive status of all files.

Bakup assures absolute file verification by comparing the original and copied files on a byte-by-byte basis. The package costs $50. Reader Service number 460.

Control Phone Costs

Long Distance Analyzer is a menu-driven program for the IBM Personal Computer and TRS-80 Models II, III, 4, 12 and 16 that streamlines accounting for long-distance costs. It is designed to save you money by organizing your phone bills, identifying parties called, producing totals and reports, and analyzing geographic patterns.

Long Distance Analyzer is designed to cut abuse and waste, bill phone costs to clients, recover phone company billing errors, evaluate special services (like WATS), print an alphabetical directory and cost account by your categories. You can accumulate monthly bills for long-term analysis.

The IBM version requires 64K, 1.0 or 1.1 DOS, and one floppy disk drive. The TRS-80 version requires at least 48K, TRSDOS and two disk drives. A printer is helpful but not required. It costs $195. Golden Braid Software, PO Box 2934, Sarasota, FL 33578. Reader Service number 461.

An Apple Cross Assembler

Allen Systems' (2151 Fairfax Road, Columbus, OH 43221) SX-48 is a cross assembler software package for the Apple II computer. The program allows MCS-48 (8021, 8022, 8048, 8049, 8748 and 8749) software development on the Apple II system.

The SX-48 package consists of an editor and assembler. The editor lets you create 8048 assembler programs, as well as conventional text files. Files that are created may be either saved on disk or used as input to the assembler. The assembler generates both a program listing and the object code.

The SX-48 is designed to provide a utility that allows 8048 development on a computer system that is both popular and affordable.

The cross assembler is written in 6502 assembler and assembles at a rate of about 1000 lines per minute. The SX-48 requires an Apple II Plus, at least 48K RAM and at least one disk drive. It costs $55. Reader Service number 468.

Two Inexpensive Apple Programs

8th Dimension Enterprises (PO Box 62366, Sunnyvale, CA 94088) has released two programs for the Apple II Plus computers: Personal Inventory and Beginners Text Writer.

As the name suggests, Personal Inventory is designed to organize your personal library and personal items. It provides an inventory, a locator and a cross reference.

With Personal Inventory, you don't have to thumb through technical journals for that special technical reference. You can do a quick search and sort for partial spelling; no special codes are needed.

With Personal Inventory, you can, for example, log out demo and customer loaner-type tools to companies or people who buy from you. The program also can tell you if you loaned a book out of your personal or technical libraries. The program costs $59.95.

Beginners Text Writer is a program that prints your letters, memos, notices and so on. The output is in all capital letters, unless you are using an Apple IIe. No commas or semicolons can be used. Files can be saved, viewed on the screen, edited, resaved under a new name and appended. It costs $15.95. Reader Service number 471.

Get the Facts—Fast

Fast Facts is an executive filing system/report writing program designed for executives, office workers and home users of the IBM Personal computer and compatibles.

Fast Facts can store anything from personal records to mailing lists to recipes. Information can be called up by last name, address, zip code—there are as many ways to retrieve information as there are users. Information can be called up in combinations; for example, all the "Joneses" in the 02159 zip code.

Fast Facts can write information to other spreadsheet programs, such as VisiCalc, 1-2-3 and MultiPlan. Fast Facts data converted to DIF (a format used for data storage by many popular software packages) can then be read by

Win up to $500 Worth of Prizes!!!

Now is your chance to cash in on your robotics programming skill and creativity. Enter the first Microcomputing/Heath Company HERO 1 programming contest and win up to $500 worth of prizes.

Microcomputing magazine, in conjunction with the Heath Company, manufacturers of the HERO 1, invites all HERO 1 programmers to submit their best applications to this contest. Entries will be judged in the following categories:

1. Standard HERO 1 with arm.

2. Modified HERO 1, including additional RAM or ROM, as well as any mechanical or electrical modifications.

Prizes will be awarded to the top three entrants in *each* category. Two $500 gift certificates (one from each category) will be awarded. Each first place winner will select the prizes of his choice, worth up to $500, from the latest Heath Company catalog. A $100 gift certificate, good toward any purchase from the Heath catalog, will be awarded to both second place winners. Third place winners from each category will receive a copy of Microcomputing columnist Mark Robillard's new book, "HERO 1 Advanced Programming and Interfacing," plus a one-year paid subscription to Microcomputing magazine.

CONTEST RULES

1. All programs must be submitted both on cassette tape and in hard copy form. A brief, written description of the application must accompany each entry.
2. Entries in the modified category must include a complete description of the alterations performed on the robot.
3. The contest is open to all HERO 1 owners, except employees of Wayne Green Inc. (publisher of Microcomputing), and the Heath Company and and their immediate families.
4. All entries, including programs, become the property of Microcomputing.
5. All entries must be received by Microcomputing by September 1, 1983.

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Peterborough, N.H. 03458

7. Contestants may submit more than one entry in one or both categories.

Entries will be judged on originality and technical feasibility. The more practical and easily adaptable the application, the better. Winners will be announced in the December 1983 issue of Microcomputing. So rev up your robot, and let's put the Heath's HERO through its paces!

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any program capable of reading DIF.

Fast Facts' file copy utility will copy any Fast Facts file and in the process rewrite and compact it for more efficient use of search and file space. The format alone can be copied, assuring that a new file will have the identical format.

Fast Facts provides 1000 forms per file, up to 50 pages per form and 100 items per page. A page is one screen—80 columns wide and 20 rows long. The program requires two disk drives, either two floppies or one floppy and one hard disk; and 128K RAM. It costs $195 and is available from Innovative Software, Inc., 9300 W. 110th St., Suite 380, Overland Park, KS 66210. Reader Service number 463.

Making Plans

Plan80 Version 2.6 is a financial planning program that has the ability to consolidate any number of spreadsheets and transfer any values between sheets, automatically.

Plan80 has an interactive spreadsheet mode and provides all of the common trig, math, financial and depreciation functions including ACRS, NPV (net present value) and IRR (internal rate of return).

It uses user-assigned names, such as Sales – Costs = Margin, for rows and columns. Models can be created quickly because the model statements are entered with any familiar editor or word processor. It offers sophisticated features like if. . . then . . . else logic, a screen graphics mode and fast data-entry functions.

Plan80 lets you transfer and consolidate parts of many spreadsheets by matching or equating row or column names. Values can be transferred from rows to columns or vice versa. Values can be referenced with a column shift forward or backward.

Plan80 has extensive report formatting capabilities, including variable decimal places, dash/zero or blank for nil values, brackets for minus, under/overscoring and spacing, $ and % signs, and suppression of nil value rows. Models can be automated so that you can change one value and recompute and print a 30-page model with a single command.

Plan80 requires 56K for an 8-bit system and 128K for a 16-bit system. It operates under CP/M 80, CP/M 86, and MS DOS. It costs $295 and is available from Business Planning Systems, Inc., 2 North State St., Dover, DE 19901. Reader Service number 462.

Can You Remember?

The Einstein Corporation (11340 W. Olympic Blvd., Los Angeles, CA 90064) has released two software programs: Memory Trainer and the Einstein Compiler.

Memory Trainer is designed to help you improve your ability to remember faces, dates, telephone numbers, lists and quotations, and to employ association as a memory tool.

Einstein's Memory Trainer is a fully structured tutorial system with color graphics that operates on the Apple, Atari 800 and Commodore-64 computers.

The software package includes a comprehensive user's guide and three separate disks containing instructional materials. It costs $89.95.

The Einstein Compiler is designed to take the waiting time out of Applesoft Basic programs. By automatically translating Applesoft Basic programs into efficient Apple machine language, the Einstein Compiler greatly reduces running time—making it 20 times faster in some instances.

By accelerating a program's execution speed, the Einstein Compiler lets you retain the programming convenience of Applesoft.

The Einstein Compiler requires one disk drive and DOS 3.3; it operates on the Apple IIe, Apple II Plus with at least 48K, Apple II with RAM card or Applesoft in ROM, or Apple III. It costs $129. Reader Service number 465.

The Accounting Partner

The Accounting Partner, from Star Software Systems (20600 Gramercy Place, Torrance, CA 90501), is a complete accounting system for CP/M systems and the IBM Personal Computer.

The package includes General Ledger, Payroll, Accounts Receivable, and Accounts Payable programs. The Accounting Partner is designed to offer the features of accouting programs that sell for much more.

The Accounting Partner will run on any CP/M, CP/M-86, MS DOS or PC DOS computer (8 or 16 bit), and requires a minimum of 56K RAM; two disk drives or hard disk; a 24 × 80 video display with cursor addressing and a printer with 132 columns. It costs $395. Reader Service number 467.

An IBM Word Processor For Less Than $60

Micro Architect, Inc.'s (6 Great Pines Ave., Burlington, MA 01803) Word-X is a $58 word processor for the IBM Personal Computer.

The program consists of two modules: a full-screen editor and a text processor.

The editor features word-wrap and global-search capabilities. The text formatter offers a file/merge feature, a selection option that allows you to print form letters selectively, multiple text files and text formatting commands e.g., underline, subscripts, superscripts, boldface and italics).

Word-X requires a minimum of 96K, one single disk drive and PC DOS (MS DOS). Reader Service number 466.

CP/M Programs

United Software Associates (38A W. Oakland Ave., Oakland, NJ 07436) has released a Sort/Merge program and an Index Card File Program for most CP/M- and MS DOS-based systems.

The Index Card File is designed to provide a freeform for entering data that you wish to store in file form, without the constraints of a file management system using fields.

The Index Card File's features include an on-screen display of the current disk drive, the file name, the number of cards in a file; the function and the section of the menu being used.

The Index Card File will let you—

- Perform arithmetic calculations on any part of any given system and transfer it to another part of that card.
- Search for a word(s) on each card in a file.
- Sort cards into ascending or descending sequence; alphabetize them and/or group them into groups of more specific or related categories.
- Have a list of all the files automatically collected on the disk, display the list when needed, erase or rename any file or change a file's disk.
- Print all or selected cards in a file and/or list of the keys.

The Index Card File costs $49.45. The program requires an 8080, 8085, Z-80, 8086 or 8088 processor; CP/M-80, CP/M-86, MS DOS (PC DOS) operating system; and 64K.

The Sort/Merge *program is* designed to let you—

- Organize files in a particular order by sorting or indexing on up to ten keys.
- Sort or merge up to three files at a time, and index any file.
- Handle sequential or random files.

With Sort/Merge, you control what the program will do because you set the parameters of the operation. The program asks questions to prepare the system with information it will need to perform the particular operation.

The program asks the number and size of the input file(s); the type of input file(s), random or sequential; the order desired for the output and whether it should be sorted or indexed; and the number of keys to use to sort or index.

Sort/Merge has the same requirements as the Index Card File. It also sells for $49.45. Reader Service number 470.

Flex File for the VIC and 64

Webber Software (Box 9,

Southeastern, PA 19399) has released a database management system for the Commodore-64 and VIC-20, as well as for the PET/CBM. Flex File 2.1, written by Michael Riley, offers all the features of earlier versions for the larger Commodore machines.

With Flex File 2.1, a whole disk can be used for files, even with a single disk drive. There are 16 menu-driven programs totaling about 97K. Records can be up to 254 characters and have 20 fields.

With 1540 disk drive, there can be over 3800 records of 31 characters and one key. With records of 254 characters and three keys, the maximum number of records is 536. Up to ten keys may be selected.

File editing features include add, replicate, change, delete, previous, goto, find, browse, key, user, limit, snapshot, wipe and return to file menu.

Flex File 2.1 keeps all records in order by all keys at all times. Maximum key filed depth is five. All mathematical (including log/trig) operations can be performed on any numerical field or column. Reports can be printed with nested subtotals, totals, averages, ratios, graphs or special user-defined results.

With Flex File 2.1, you have control over the printed format. There are commands to printer, headers, column titles and content, calculated results, rounding and justification.

Flex File 2.1 costs $110. Reader Service number 472.

For Weekend Investors . . .

Stock helper is designed to help you track the ups and downs of the stock market. Developed by a weekend investor for other weekend investors, Stock Helper lets you maintain a history on disk of stock prices and market indicators.

Stock Helper is a menu-driven tool that displays charts and calculates moving averages over a 52-week period.

Special features of Stock Helper include input templates, choice of price form (decimal, fractions or eighths), and the capability to print charts. Stock Helper accommodates stock splits, name and symbol changes and sorting by name and market. Stock Helper refrains from giving advice.

Stock Helper is available for the Commodore-64. VIC-20 and Atari 400/800/1200 versions are planned for the near future.

Stock Helper costs $30 and is manufactured by (M)agreeable software, inc., 5925 Magnolia Lane, Plymouth, MN 55442. Reader Service number 475.

Transferring Files

Xeno-Copy lets you transfer files to your IBM Personal Computer or IBM PC-XT from disks formatted for other computers. No additional hardware or modems are required; all you need is Xeno-Copy and the actual disk.

Xeno-Copy is fully menu-driven and is designed to be easy to use. If you have an IBM PC at the office and a non-IBM-compatible portable in the field or at home, you can take the disk to the office, run the Xeno-Copy software utility, insert the foreign source disk into one of the PC's disk drives and a PC DOS formatted disk in the other drive. Select the desired files from the source disk's directory and the file will be transferred in a matter of seconds.

Xeno-Copy can directly transfer disk files to your PC from many systems: IBM CP/M-86, Kaypro II, Osborne Executive I, TRS-80 Model III CP/M, Zorba, Morrow Designs and others.

Xeno-Copy runs on the PC or XT and is fully compatible with PC DOS 1.1 and 2.0 as well as with various hard disk setups. Separate versions for the Compaq, the Eagle 1600 series, the Corona PC and the Chameleon will be released in the near future. A capability for direct transfer of TRS-80, TRSDOS disk files will also be added.

Xeno-Copy costs $99.50 and is available from Vertex Systems, 7950 W. 4th St., Los Angeles, CA 90048. Reader Service number 472.

NEW PRODUCTS

Edited by Dan Muse

More Software For Franklin

The ACE 80 CPU, from Franklin Computer Corp. (2138 Route 38, Cherry Hill, NJ 08002), is a plug-in module that is designed to expand the software available for Franklin computers. With the ACE 80 CPU, the Franklin ACE computers can run both Apple II and CP/M software.

The ACE 80 CPU includes a Z-80 processor and operates at 6MHz. This reduces processing time for most CP/M business applications. The ACE 80 CPU also includes 64K of RAM. It provides a horizontal scrolling capability for systems that do not include an 80-column card. The 40-column window can be scrolled horizontally, permitting 80 columns to be viewed, 40 columns at a time.

The ACE 80 CPU also includes system and utility disks that contain a large selection of useful programs, including file maintenance, conversion and copying routines, peripheral control routines and program development, and debugging aids. Files created under DOS can be converted to CP/M and vice versa. The package also includes CBasic, a comprehensive compiler/interpreter for use with CP/M. The ACE 80 CPU card costs $449. Reader Service number 480.

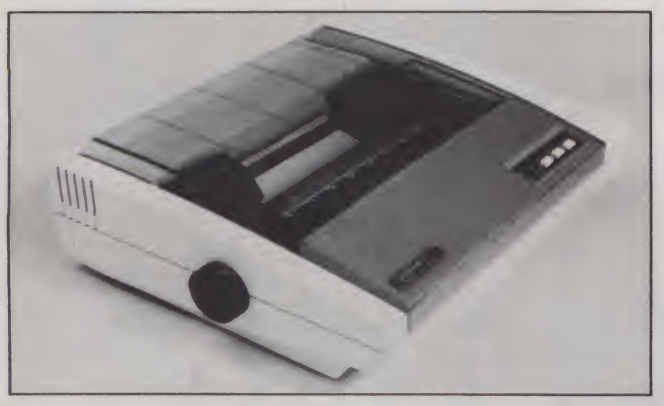
Get the Spirit

The Mannesmann Tally Spirit is a dot-matrix printer designed for the home and small-business microcomputer user. The Spirit can be used with all major personal computers, including those from Apple, IBM and Tandy.

The Spirit uses a combination of mylar film ribbon and the full space of its 9×8 matrix; this results in high-print resolution and intensity. The printer has a unique printhead that uses square hammers that overlap to form more fully connected horizontal and vertical lines, rather than a row of discrete dots.

Standard features of the Spirit include tractor as well as friction paper feeds. The tractor width can be adjusted to handle narrow-width label stock or fanfold business forms up to ten inches wide. The friction feed can be used for single-sheet and letter stock and roll paper. The printer operates at 80 characters per second.

The Mannesmann Tally Spirit costs $399. A Centronics parallel interface is standard; an optional serial interface is available. Mannesmann Tally Corp., 8301 South 180th St., Kent, WA 98031. Reader number 482.



The Mannesmann Tally Spirit is a dot-matrix printer that gives home and small-business users full-space, carbon-ribbon quality at a speed of 80 characters per second.

Trak's Intelligent Drives

Trak Microcomputer Corp.'s (1511 Ogden Ave., Downers Grove, IL 60515) intelligent drive systems—the AT-D1 and AT-D2—are designed to enhance the performance of the Atari 400, 800 and 1200 microcomputers.

AT-D1 and AT-D2, Trak's single- and dual-density systems, feature an on-board microprocessor and programmed memory to control a disk drive and a printer.

A pressure-sensitive control panel tells you of the system's activities through read and write indicators, and a touch-sensitive write-protect switch protects your valuable data on command. A digital track counter tells you where every bit of your data is located.

Atari's standard single-density operation with the AT-DI, or AT-D2's double density capabilities, instantly doubles your storage capacity. The built-in intelligent controller provides an interface for a Centronics parallel printer for the Atari, eliminating the need for an Atari interface unit.

Trak's drives feature advanced half-height mechanisms with steel band-head positioning and direct-drive beltless dc motors to assure accurate head positioning, reduced disk wear and longer, reliable operation. Track-to-track access time of five ms is made possible by a low-friction carriage design.

The AT-D2 sells for less than $500. Reader Service number 494.

Trak Microcomputer Corp.'s AT-D2 provides the storage of two Atari drives and a printer interface for less than $500.

Orange's Apple Interface

Orange Micro, Inc. (1400 N. Lakeview Ave., Anaheim, CA 92807), has released the Orange Interface. This parallel interface board features more than 15 firmware commands for text screen dumping and formatting on the Apple II, II Plus and IIe. The Orange Interface is compatible with most parallel printers.

The Orange Interface offers an 80-column screen dump for the Apple IIe. Other commands include a 40-column screen dump, page length and margin sets, add or delete linefeeds. When not in use for formatting, the Orange Interface acts as a standard parallel interface, compatible with virtually all Apple software, CP/M and Pascal.

The interface costs $87 and includes complete documen-

The Star-lite HD20, from Computershop, is an S-100 bus portable computer that features 20 megabytes of hard-disk storage.

The Anadex DP-9725A Color/Scribe printer is capable of printing multiple colors in four modes.

tation, a five-foot parallel printer cable and a full 90-day warranty. Reader Service number 488.

An S-100 Bus Portable with Hard Disk Storage

The Star-lite HD20 is an S-100 bus portable computer with 20 megabytes of hard disk storage built in. An automatic hard-disk lock protects the Winchester disk.

The HD20's three open slots on the S-100 bus let you add numerous specialized applications to the computer. The computer features 26 programmable function keys that let you program an up to 13-character-long command filename into each key.

The Star-lite HD20 uses a Z-80A CPU with 64K RAM and has a processor speed of 4MHz. The computer's operating system is CP/M 2.2. The computer also features a nine-inch screen that displays 24 lines and 80 columns, a detachable keyboard and word processing, spreadsheet and modem software.

In addition to the 20 megabytes of hard disk storage, the HD20 offers 183K of 5¼-inch floppy disk storage. The computer costs $4995 and is manufactured by Computershop, 139 First St., Cambridge, MA 02141. Reader Service number 489.

Apple Dumpling-S

The Dumpling-S, from Microtek, Inc. (4750 Viewridge Ave., San Diego, CA 92123), is a completely menu-driven serial interface card for Apple II, II Plus, IIe, Franklin, Basis and other Apple lookalikes.

The Dumpling-S can operate as both a printer driver and a modem port with no PCB changes. Each Dumpling-S board is supplied with a cable to be attached to one of its two 24-pin headers—one is for printers and the other is for modems. The cable is terminated in a 25-pin DB-25 connector, chosen to chassis mount on the rear of the Apple IIe. Two cables may be attached to the Dumpling-S at one time, so both appear on the rear of the Apple.

The Dumpling-S costs $199. Reader Service number 491.

Two Anadex Printers

Anadex, Inc. (9825 De Soto Ave., Chatsworth, CA 91311), has released two printers: the DP-6500 Rapid/Scribe and the DP-9725A Color/Scribe.

The DP-6500 Rapid/Scribe achieves speeds of 500 cps at 10 cpi and 540 cps at 12 cpi. Key to the high-printing speeds is an 18-needle printhead consisting of two vertical columns of nine each. Since the two columns of print needles are adjacent, two identical columns of dots may be printed at one time.

The DP-6500 features enhanced mode printing with either proportional spacing or ten, 12, 15 and 16.4 cpi at speeds up to 410 cps. Seven International Standards Organization (ISO) character sets are included: Swedish, Danish-Norwegian, German, French, Spanish, Italian and standard USASCII. The high-resolution graphics mode provides a dot resolution of either 72 or 144 dots per inch.

The DP-6500 costs $2995.

Anadex's DP-9725A Color/Scribe printer produces multiple colors in four modes, including enhanced, correspondence and data processing quality, as well as high-resolution graphics. Printing versatility is achieved by single- and multiple-pass modes, which permit full-color capabilities and multiquality characters.

For color printing, the DP-9725A employs a four-color ribbon with yellow, magenta, cyan and black bands. A single color can be selected for each pass of the printer, providing multiple color combinations. The printer also has the ability to change colors at any point in a printed line.

One of the DP-9725A's applications is printing graphics such as barcharts and curves in various colors. Graphics resolution is 144 or 72 dots per inch in both horizontal and vertical dimensions.

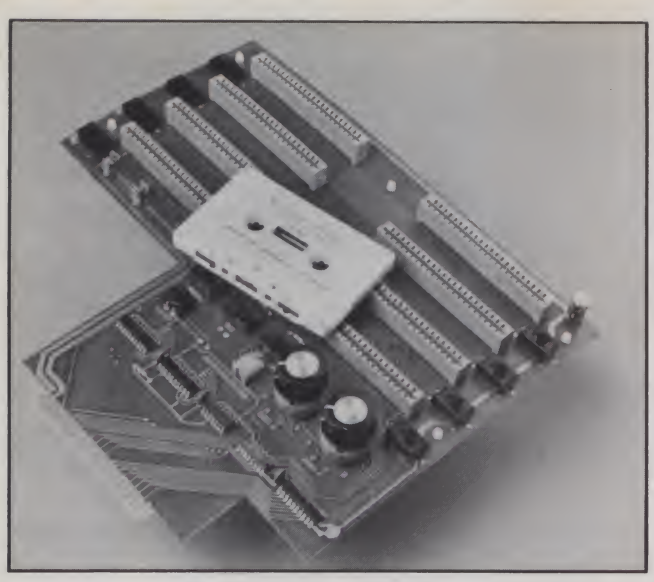
DP-9725A features the same seven ISO character sets as the DP-6500. Other features of the DP-9725A include left, right and full justification; title centering; positive halfline feed; in-line font changes; and RAM expansion to 12.5K in 4K increments. The printer costs $2350. Reader Service number 481.

VIC's Supermother

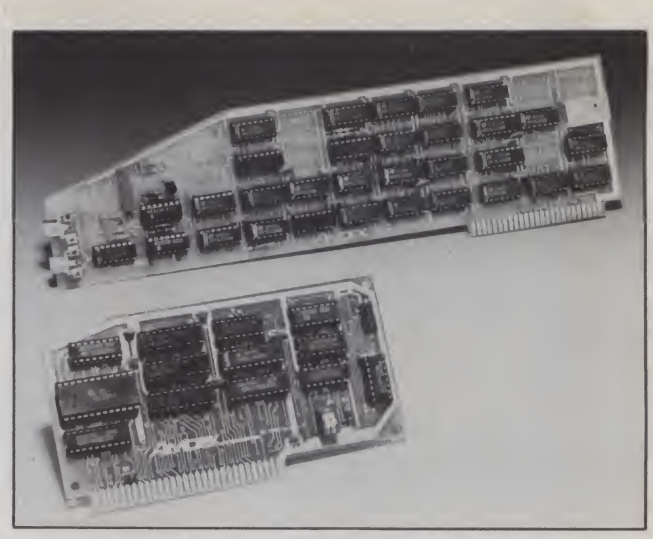
Compuscope (6400 Signal) St., Tillamook, OR 97141) has designed its Supermother expansion board to inexpensively add features, functions and performance capacity to the Commodore VIC-20 computer.

With the Supermother you get—

The Anadex Rapid/Scribe printer achieves speeds of 500 cps at ten cpi and 540 cps at 12 cpi.



Compuscope's Supermother expansion board is designed to add features, functions and performance capacity to the VIC-20.



Amdek's Digital Multiplexor Board (top) plugs into the Apple II or II Plus and is designed to give RGB output with switchable color text in any high-resolution color.

● Eight switch-selectable cartridge slots. You can run single or mulitple VIC-20 program cartridges, add memory, run utility programs and add up to 35K of add-on memory.

● System reset button, which eliminates wear and tear on the VIC-20. Supermother resets the computer at the touch of a button.

● Pause button. Supermother lets you stop a program in progress and start it up again at your command.

● Replaceable fuse. It protects your VIC-20's power supply from accidental damage.

● Write-protection switch. This switch, when used with Blocksave software (which is included), lets you make back-up copies of cartridge programs on tape or disk.

Compuscope's Supermother is fully buffered to ensure accurate data transmission from the board to the VIC-20. It features simple, rear plug-in installation and is compatible with most VIC-20 expansion modules. The board sells for $129. Reader Service number 484.

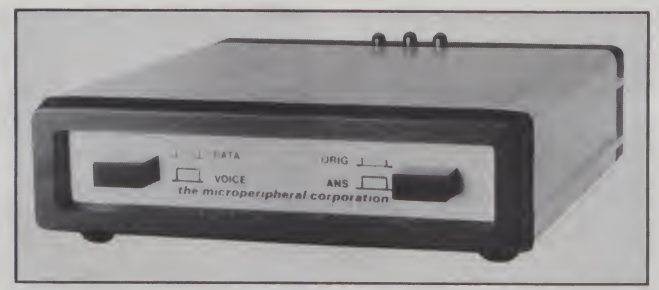
Commodore-Atari Modem

The AutoPrint-Microconnection, from Microperipheral Corp. (2565 152nd Ave. NE., Redmond, WA 98052), is a modem for the Commodore-64, VIC-20 and Atari computers. The unit features both an autodial and autoanswer capability. It also has a built-in Centronics-compatible parallel printer port.

Enclosed in a professional quality extruded aluminum case, the modem operates at 300 baud in either originate or answer mode. The combination modem and printer interface plugs directly into the computer without the need for additional interface devices. Telecommunication software is included in the user's manual.

The printer port lets you connect conventional parallel printers, such as Epson and Okidata. With the modem connected to the phone line, the printer will simultaneously provide hard copy of whatever appears on the screen.

The AutoPrint-Microconnection measures 5×6×2 inches and weighs two pounds. It costs $149.95. Reader Service number 483.



The AutoPrint-Microconnection provides VIC-20, Commodore-64 and Atari computer users with both autodial and auto-answer capability. It also has a built-in Centronics-compatible parallel printer port.

Color Board For the Apple

The Digital Video Multiplexor Board (DVM-II) plugs into any expansion slot of an Apple II or Apple II Plus computer and is designed to supply RGB output for analog or digital monitors. The board features 15 low-resolution colors (16 with an analog monitor) and two additional high-resolution modes: all white and three-color with pure white, and is color selectable for all green or other colored text.

The DVM-II is expansion-slot independent. With a simple plug-in installation, it can supply the computer with RGB output. The board uses Apple NTSC video output. The board will provide 80-column capabilities in high-resolution colors with the use of any RS-170 output, 80-column card.

The DVM-II includes two connector cables and one video monitor connector cable to allow the board to be adapted to the monitor. The functioning of the DVM-II is controlled by software switches that are slot dependent. The board is manufactured by Amdek Corp., 2201 Lively Blvd., Elk Grove Village, IL 60007. It costs $199. Reader Service number 492.

The AT-100: Plug It In, and Go

The AT-100 is an Atari plug-compatible printer that comes with everything needed to perform low-cost word processing and graphics on the Atari 400, 800 and 1200 computers.

The AT-100 is shipped with a cable that plugs directly into the Atari user/serial port and doesn't require the 850 interface.

The AT-100 includes hi-res screen dump software and uses standard-width fanfold paper with a cartridge ribbon. Other peripherals, such as disk drives and cassette recorders, can be daisy-chained to the printer without the need for an 850 interface. A minimum system might include the Atari 400, a cassette recorder and the AT-100.

The price of the printer is

Axiom's AT-100 printer is a low-cost printer ($299) that comes with everything needed to perform word processing and graphics on Atari computer systems.

$299. It is available from Axiom Corp., 1014 Griswold Ave., San Fernando, CA 91340. Reader Service number 493.

A Printer For All Computers

The Alphacom 81 is an 80-column printer with graphics capabilities for many home and personal computers, including Commodore, Apple, Atari and the TRS-80 Color Computer.

The printer can print up to 80 characters per second. It combines a single-chip microprocessor with the Olivetti THM-125 dot matrix print mechanism, using thermal technology.

The unit is packaged in a lightweight, impact-resistant plastic housing that covers the thermal paper roll. The printer's other features include friction feed and the capability for bit-mapped graphics.

The Alphacom 81 can be linked to most home computers by plugging the appropriate interface into the printer's cartridge-like slot.

The printer can print in upper- and lowercase and has a wrap-around facility for printing text lines longer than 80 characters. It recognizes standard ASCII control of action codes for changing printing modes. Codes include carriage return, line and multiline feed, right justification, form feed and graphics controls.

The Alphacom 81 costs $169.95. Alphacom, Inc., 2323 South Bascom Ave., Campbell, CA 95008. Reader Service number 487.

The Alphacom 81 is a low-cost ($169.95), 80-column, thermal printer with graphics capabilities. The printer can be used with Commodore, Apple, Atari, Tandy and Mattel systems.

Bring Your Timex Up to 64K

Gladstone Electronics (1585 Kenmore Ave., Buffalo, NY 14217) has introduced a 64K RAM expansion for the Timex-Sinclair 1000.

Gladstone Electronics' 64K RAM expander transforms the Timex-Sinclair 1000 into a powerful tool for business, educational and household uses.

The Gladstone 64K RAM is designed to expand the capacity of the TS-1000 to its maximum, transforming the small, inexpensive computer into a powerful tool for business, educational and household uses.

The 64K expander features a precision-molded plastic case with a quality edge connector for a tight fit to the expansion port of the TS-1000.

The Gladstone 64K RAM expander can be purchased for less than $100. Reader Service number 486.

Pronto's 16-bit Computer

Pronto Computer, Inc.'s (3170 Kashiwa St., Torrance, CA 90505) Series 16 is a full 16-bit computer. The computer utilizes Intel's new iAPX186 microprocessor and comes standard with 128K bytes of RAM; the system can be expanded to one megabyte. Serial and parallel ports, a clock/Calendar and a system security ROM are also included.

The Pronto Series 16 is available in four configurations: an 800K formatted floppy disk drive version ($2995); a dual floppy disk drive version with 1.6 megabyte capacity ($3750); a single floppy disk drive version with a removable 5M hard disk drive ($4995); or a dual five megabyte removable hard disk drive version ($5995).

Pronto's keyboard will adjust to three height levels. It provides adjustable acoustic feedback, letting you type silently or with audio response. The keyboard has a standard typewriter layout and has a complement of ten user-programmable function keys and separate cursor keys and numeric pad.

All software currently available for MS DOS 20 will operate on Pronto's Series 16, including many programs developed for the IBM Personal Computer and XT. Reader Service number 485.

The Pronto Series 16 is a full 16-bit microcomputer with 128K RAM.

REVIEWS

(From p. 146)

Summary

The whole process requires less effort to implement than it does to describe or read about. Merely call up the program, feed it the file to be checked and respond to appropriate prompts. *Voilà!* An accurately proofed file, with no need for subsequent operations.

The program does not replace the original file; it merely renames it to (filename).BAK, and names the corrected file with the original extension.

All in all, this is an excellent package. The software performs as advertised, and the documentation is at an appropriate level of complexity. *(Aspen Software Co., PO Box 339, Tijeras, NM 87059, $50.)*

Mitchell Hobish
College Park, MD

Apple II-6502 Assembly Language Tutor

If you thought you couldn't
Learn assembly language,
Read on

I've had an Apple II since August 1978. Since September 1978, I've been trying to learn assembly language programming. I've spent more than $100 on books that have promised to teach me. But even now, all the programs I have written are in Applesoft or Integer Basic—not one in assembly language. I can't seem to get the hang of it.

But that's beginning to change, with a new book—no, a package—by Richard Haskell, called *Apple II-6502 Assembly Language Tutor* (Prentice-Hall, Inc.). For $34.95, you get a well-written book plus a disk-based program that supports the text in a manner discussed later.

The package requires that you have at least a 48K Apple II, II Plus or IIe, with a disk drive. (The book doesn't mention a IIe, but the program runs on mine, so what the heck?)

It's not that the book is easy—it's not, as far as I'm concerned, because my mind doesn't bend that way. The concepts themselves are difficult for me.

It Is Possible

But this book is different. It's just hard, not impossible. The thing that makes the difference is the fact that it's written around a companion program called Tutor. This program displays your Apple's memory and register contents while your example programs are executed. Finally! Hands-on assembly language tutoring!

The program reminds me a bit of VisiCalc. You move around in the display with the left and right arrow keys, and toggle those keys between vertical and horizontal movement with the space bar. A hyphen or exclamation mark in the upper right-hand corner of the screen tells you whether you are in horizontal or vertical mode. Typing a □ lets you jump directly to whatever memory location you specify.

The command structure is similar, too. Typing a / puts you in command mode with 14 commands available. The commands are—

/B Set breakpoint
/D Delete a block of bytes
/E Execute a program
/F Find a particular string of bytes
/I Insert any number of hex bytes
/L List a disassembled portion of memory
/M Enter hex or ASCII values in memory
/O Calculate branching offset
/P Print a disassembled portion of memory on a printer
/R Change the contents of a register
/S Storage (L for load, S for save—sound familiar?
/T Transfer a block of bytes
/Q Quit (D for DOS, M for monitor)
/Z Display the copyright message

I can't discuss all of these commands, because I haven't finished my training. But I will finish, because this marriage of text and software makes it possible for me to understand; that's the difference between this package and mere textbooks on machine language programming. It doesn't make it easy—not for me, at least—but it does make it possible.

Chapter subjects are pretty standard. They have to be, because the subject of machine language programming has natural divisions. So this book, as do most of the others I have collected, has chapters on the 6502 Microprocessor, Computer Memory, the 6502 Registers, 6502 Arithmetic, Branching Instructions, the Stack and Subroutines, Addressing Modes, Displaying Characters on the Screen, Low-Resolution Graphics, High-Resolution Graphics, Using the Game I/O Connector, Using the Peripheral I/O Slots, the 6821 Peripheral Interface Adapter (PIA), and Interrupts and Serial I/O—the ACIA. In addition, it has three appendices called The 6502 Instruction Set, The Tutor Monitor and Using Machine Language Subroutines with Basic. All in all, it pretty much covers the ground.

The first chapter is an introduction, designed to convince you that learning assembly language programming is worth the effort. It explains that when you begin to program in earnest, you'll want to use an assembler to convert mnemonics to machine language code—but that you'll do it by hand in this book, to give you a more thorough understanding of what's going on.

Chapter 2 gives you the necessary preliminary information—for example, discussing the data bus and counting in binary and hexadecimal. It also introduces you to the Tutor program, and gives you some hands-on training right away. Your success in this is pretty much guaranteed. You finish the chapter with a sense of accomplishment. You don't really know what you're doing yet, but you can see that it won't be long.

And it won't. Chapters 3, 4 and 5 bring you up to speed on basic information with discussions of computer memory, the 6502 registers and 6502 instructions—all reinforced with exercises using the Tutor program.

From then on, things get pretty specific. This is where, with other books, my brain gives me an overflow error. Locally, I'm known as the "Chapter 5 Dropout." But with the help of the Tutor that's not happening. I must be getting sick, because it's beginning to make sense.

I think most of us purchase textbooks with the subconscious idea that if we read them we will somehow acquire all the knowledge they contain—by osmosis, perhaps. I know I do. I'm a sucker for any book whose flyleaf tells me that it can teach me all I need to know to fix a car, build a house or learn machine language programming. I'm always disappointed, because I find that although the information is there, I have to study to make it mine. This book is no different in that respect. But it is different—and better—in that its hands-on approach and the ever-ready Tutor make the study pay off. *(Prentice-Hall, Inc., Englewood Cliffs, NJ 07362.)*

David Goodfellow
Seattle, WA

Magic Window II

A smooth, powerful
And reasonably priced
Apple word processor

Did your secretary call in sick with that pesky prospectus already two days late?

Hey, don't worry. With all the word processing software available, you'll be off and typing in no time. But with so many to choose from, you may be tempted to bang your head against the display window.

Rather than risk a cracked window or head, I purchased a Magic Window (the screen displays a moving window of text that follows the cursor) because of its price and availability. The original Window was an obviously stripped-down word handler, lacking such niceties as imbedded control characters, DOS commands, and search and replace abilities,

but at $100 it was still a bargain. It turned out to be a smooth tool for typing memos.

Magic Window II is still smooth, but has now become a powerful, competent word processor. Retaining the easy-to-use menu/submenu format, this program has added some features that were sorely missed in the first Magic Window.

When you boot up, you soon find yourself in the main menu. From this point you jump to menus that control the screen output (upper- and lowercase), format your work (margins and page size), provide access to your files for retrieval and storage, send you to the screen to compose your missive, and finally help you to print it out for posterity. Of course, all of the extras are here such as justifying, deleting, moving, editing and duplicating lines. By typing CTRL-B, characters to signal print-type changes can be imbedded into the text and special characters (:|[]/½) are generated. Improvements are legion.

Shift key alterations are included. Files are loaded by number rather than name, saving time and effort.

There is advanced line and paragraph gluing to speed up your rewrites. The ability to run off multiple copies means you no longer have to repeatedly prompt the system. Search and replace allows you to mail out professional-looking appeals for money (the kind where your name and address keep popping up throughout the text). Even the manual has been expanded with a fine introduction and a section explaining unformatted files so understandably that I now make good use of this feature.

There are, however, some problems with the Magic Window II. I'm sure that some of the difficulties stem from the fact that this is the first printing, but why, oh why, don't the instructions for booting up agree with the screen output?

When you boot up, the system asks, "1-text, 2-hi-res?" Why? I'm not sure; either answer causes the same screen output. Nowhere in my manual can I find a mention of this. However, there are numerous references to a practice "Driver Diskette," which was missing when I received my Magic Window. I'm told that it's "on the way."

More serious is the fact that some of the improvements are annoying or faulty. For example, highly annoying is the new safety, which beeps loudly whenever you clear out a program you don't want to save. After the hundredth beep you'll either become adjusted or throw your disk drive at the monitor. Is this really necessary? I never accidentally erased a work file on the old system, but I did rip out my car's seat-belt beeper.

The worst flaw is the tab system. When I use an old Magic Window file, I find that every space is magically tabbed and I must clear them all out and start over. And then there's the occasional disappearing tab where the cursor vanishes from the screen. Yes, it does reappear when I hit the tab key a few times, but is this the way it's supposed to work?

Surprisingly, I'm still a fan of the Magic Window series. Despite its first printing flaws, the Magic Window II remains a reasonably priced, smooth, powerful and flexible word processor, and I do recommend it.

Magic Window II, written for Apple computers by Bill Depew, is published by ARTSCI, Inc. *(5547 Satsuma Ave., North Hollywood, CA 91601. $149.95).*

Michael A. Cherry
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DataFax

A database
That isn't really
A database

DataFax is a keyword database that disavows structure. In fact, Link Systems disavows the term "database." But whatever you call it, DataFax is an impressive system that can take the information you give it in whatever sequence, size, complexity, simplicity or jargon, and can store, sort, index, search, reference, present, print . . . with the touch of a key here and there. If you have piles of paper that seem to fit into no structural format, you should investigate DataFax.

The basic DataFax unit is called the "folder." Up to 3000 folders, each containing up to 255 pages of information with up to 60 keywords, may be developed. That should be enough. Shorter documents and keywords increase the utility of the system.

The upward limit of DataFax is a function of available disk space. Hard disks will be useful with this package. But DataFax is good to its user. If the disk gets too full, you can split the data onto other disks. Unlike many database packages on the market, DataFax lets you establish keywords and indices dynamically, allowing reference to anything you have in the file.

Sorting can be done alphabetically, numerically, by date of entry, specific subject and by any wild scheme you may envision. And DataFax gives you "wild card" options, permitting you to cut the amount of search time.

What's on the Menu?

Written in Pascal (one of the most structured languages) and operating under the UCSD-p System, this package is self-contained. Here is the opening menu:

S(etup a new database)
O(pen an existing database)
B(ack up a disk)
F(ormat or erase disk)
C(onfigure system)
T(ranslate text files)

This particular style of menu is common to Pascal users. The DataFax system, however, is largely a one-key system. Most of these options are self-explanatory, with the possible exception of the last two.

The Configure option allows you to specify the memory that can be used, as well as some peripheral data.

The Translate option provides a unique feature: the entry of text files from your word processor into the collection, allowing you to create indices on any number of words in the text. This is done through a transportability (load/unload) feature that works, but takes some technical knowledge to accomplish. More on that later.

Entry of data to DataFax is entirely freeform. There are no fixed screen stubs or templates (unless you want them and are willing to pay a price for them—even Link acknowledges that the data processing world may not be ready for structured non-structure).

The screen is blank. You enter the information, mark the keywords and file it away. There are three ways to mark the keywords—as you type them, as you review the document, or as you view the keyword list and wish to add to it. The keyword list then becomes a sorted, structured method to access totally unstructured data.

Data may be searched on the DataFax database by one of two searching methods: Examine and Scan. Examine provides record-by-record exposure. Scan displays the first line of the record as a means to select the specific data to be examined.

Keywords may be scanned for a record, for a group of records or for the entire file. Searching is Boolean. You may search by single keyword, by combinations of keywords, by selection amongst keywords or combinations thereof. The way DataFax does it looks as if you had coded your data retrieval in Cobol.

DataFax has an excellent editor, one which uses a technique I haven't seen for a few years. There are some commands that must be learned, but they are one- and two-key commands, most of which involve the use of the control key. The numeric keypad arrows move the cursor (as does the return key). Some of the features of the Basic editor work, such as insert and delete.

The insert works by pressing the insert key once for each character to be inserted. There will be some control-key confusion with other software packages, such as WordStar.

If you're not familiar with Pascal and the UCSD-p System, there are some new concepts to be learned. Be prepared for a long boot time, during which you'll wonder if your machine is malfunctioning. It takes less than a minute to load, but it seems like an eternity.

As I mentioned, it is possible to use word processing and other text files with this package. However, that is not to imply that direct entry of that data is possible. There is an intermediate translation step through DataFax's translation utility that will be nightmarish until you have the hang of it. Until that time, however, you will have to experiment—or call Link—until you get it.

This process is not one a noncomputer person will find easy to accomplish. Link would be well advised to simplify the process by providing instructions for this feature; it is not currently a part of the tutorial. There are other strange features, such as drive assignments. PC users are accustomed to referring to Drives A and B, whereas Pascal refers to them as Drives 1 and 2. This problem is not unique to DataFax, but these messages can be intercepted and translated. It's a pity that they didn't do so, but the problem is not insurmountable.

DataFax memory usage is flexible. It can be used with 64K. And while the upward structure limit seems to be 128K, DataFax indicated that it took 160K. (My system is 320K, with 160K reserved to RAMDisk.) More space provides more ability to work with text in main memory before the data has been filed out to disk. On disk there is some overhead, as well. If you have extensive data, there is no sacrifice. However, if you want to catalog a lot of little pieces of data, this may be a problem.

The minimum allocation of disk space seems to be 512K, or four 128K sectors (assuming a PC DOS-compatible eight-sector vs standard ten-sector format).

During the format command, you're asked how many blocks are desired for your file, with a default of 390. Divide 160K by 390 and you can see the size that is allocated per record. The package will permit a record of only 64K, however, and the 512K is the size of the read/write buffer. Where there is no precise formula, the amount of space taken is a function of the number and size of the keys, as some keys are stored more than once.

DataFax is well-packaged. The documentation, while not typeset, is clear and comprehensive—laced with a touch of humor in all the right places. The incorporated tutorial is good, but could be expanded to encompass all features of the system, not simply those minimum elements to initiate operation.

DataFax may not have all the bells and whistles of other database packages, but for an unstructured nondatabase database, this is an accomplished package that can turn chaos into organization as easily as any data repository software, and much more easily that some. Its facility is certainly worth considering. *(Link Systems, 1640 19th St., Santa Monica, CA 90404. $299.)*

Ken Lord
Winchendon, MA

An Example-Setting Spelling Checker
Yes, You Can Learn Assembly Language!
A Magical Apple Word Processor
DataFax—A Database That Isn't a Database

Proofreader

This spelling-checker
Should serve as an example
To other software vendors.

It's a rare pleasure to be able to recommend a product with unabashed enthusiasm. Aspen Software Co., of Tijeras, NM, has produced a proofreading program that is so easy to use, so comprehensive in its scope and so well-documented, that it should serve as an example to other software producers.

Proofreader is a spelling-checker program for CP/M or IBM Personal Computer systems, based on the Random House Dictionary. The dictionary itself comes in different sizes, depending on the capacity of the disk drives.

Upgrading the dictionary to larger sizes costs $10. The lexicons used were arrived at by ranking all the words found in several months' analysis of one computer service corporation's electronic mail. Each word was assigned a rank, from one (consistently used in communications) to 20 (words that seldom appear).

From these ranks, lexicons of several sizes have been constructed. The default version of the dictionary contains 32,000 words and requires 72K of disk space. However, dictionaries up to 83,000 words are available for some formats. Unlike several other spelling-checker programs, the dictionaries supplied with *Proofreader* contain complete words; there is no suffix or prefix stripping or hashing.

The supplier contends that this is more accurate than other compaction algorithms. For the sake of the program, a word is defined as a series of ASCII characters in the range "a" to "z" (upper- and lowercase are treated alike), separated by any of several delimiters, such as blanks, numbers or special characters. Apostrophes and hyphens are the exceptions to this rule, however, and are dealt with in a manner that depends on the environment of the mark. Hyphenation may be dealt with in either a "hard" or "soft" manner, similar to WordStar.

Program Use

Using the program is simple. You merely call up the .COM file by typing "PRF" with the appropriate filename .ext in response to CP/M's prompt. If no file is designated, the program will ask you for the name of the file you want to check.

The text file must be in ASCII format. If your text editing program doesn't generate ASCII format files, they will have to be converted before Proofreader can be used. One exception to this is the format used by WordStar, whose files are of a modified ASCII variety.

After entering the filename, Proofreader presents a screen that allows you to see the progress of the program. Total words read (as defined above) are reported. Then the words are sorted to generate a unique word list, which is then checked by the main dictionary and the auxiliary dictionary.

When finished, Proofreader reports the number of unknown words that it found. You then have several options available.

You may correct the error, display all flagged words, review all flagged words, mark flagged words in the text or exit from Proofreader. If you choose not to correct the word, all the words may be reviewed, out of context, for preliminary checking.

It is suggested that this mode be used when many proper nouns may be found in the text. If you choose not to have the program correct the error automatically, it will mark the appropriate words in the text with a "#." Subsequent use of a search function in a word processing program will allow location of these marked words. This automatic correction could cause problems in files whose contents have been "hard" right justified; correction of the error may result in a line that is no longer right justified.

Interactive correction is the normal mode. Two lines of context are shown for each error. The word is underlined or, if your terminal/computer supports any of several video attributes (e.g., reverse video or half intensity), the word may be highlighted in this manner.

The word may be corrected immediately, with the correct word substituted into the text, and may subsequently be learned by the auxiliary dictionary. The word may be accepted for the remainder of the checking session, or it may be accepted "just this once," and therefore queried again if found later in the document. This process precludes the necessity of having words merely marked by the program, requiring you to enter your text editing program for changes.

If you're not sure of the spelling of a word, a single keystroke allows you to access the dictionary for a list of words that are fairly close in spelling to the one in question.

There are a couple of bugs in this routine. Questioning the spelling of a word whose first two or three letters are near the end of the alphabet may result in display of words that are not at all close to the word in question. This is a small problem, however, and doesn't affect the efficacy of the program.

At the end of a checking session, any of several options may be selected, depending on the defaults chosen during installation of the program. If any words are learned during the session, these entries will be placed in the auxiliary dictionary. There is a practical limit to the size of this auxiliary dictionary in that excessive length will slow down the checking process; the master dictionary may be updated by adding entries from the auxiliary dictionary, using the PRFADD program, which is supplied.

(Continued on p. 142)

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